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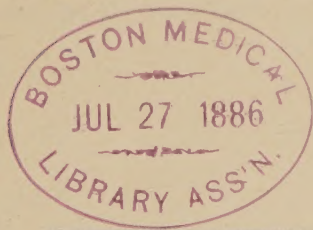
FIFTH ANNUAL REPORT

OF THE

STATE BOARD OF HEALTH

OF

NEW YORK.



TRANSMITTED TO THE GOVERNOR, APRIL 9, 1885.

ALBANY, N. Y.:
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STATE OF NEW YORK.

No. 47.

IN SENATE,

APRIL 9, 1885.

FIFTH ANNUAL REPORT OF THE STATE BOARD OF HEALTH.

STATE OF NEW YORK:

EXECUTIVE CHAMBER,
ALBANY, *April* 9, 1885. }

To the President of the Senate:

I have the honor to transmit herewith the annual report of the State Board of Health, for the year 1884.

DAVID B. HILL.

[Sen. Doc. No. 47.] 1



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THE STATE BOARD OF HEALTH OF NEW YORK.

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DR. ALFRED L. CARROLL, *Secretary*, New Brighton, Staten Island.

FREDERICK CARMAN, *Assistant Secretary*.

State Superintendent of Registration and Vital Statistics.

DR. ALFRED L. CARROLL, as Secretary of the Board.



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REPORT.

The system of registration of vital statistics in this State is of comparatively recent origin, and in the majority of our sanitary districts its results are as yet so inaccurate as to invalidate any effort to draw useful conclusions from the available data.

As regards the records of nativity, the incompleteness of the returns is especially conspicuous. For obtaining these returns, reliance is practically placed upon the medical profession alone ; but in nearly every locality many births take place without the attendance of a physician, and these commonly escape record. In the absence of qualification or registration of midwives, many of these who pursue their avocation among the poorer classes, are as ignorant of the requirements of law as of medicine, and the results of their ministrations are seldom brought to the knowledge of local boards of health. Furthermore, among women who have previously borne several children, it is not a rare occurrence for a confinement to happen without the aid of either a physician or a midwife ; some member of the family or obliging neighbor performing the few necessary offices of the lying-in chamber. The only practicable method to secure an approach to completeness in this respect would be to make the parents or custodians of infants responsible for securing the registration of births ; and this would be quite feasible if the people could be taught that all which seems burdensome in the machinery of registration, was designed chiefly for their private benefit. The sanitarian is concerned in learning the number of births of either sex, which have occurred in the localities under his observation, and the number of deaths at different ages, with their direct and indirect causes. The names and other genealogical details interest him little, but serve for purposes of identification in forensic processes. Particularly in view of the great influx of immigration, questions involving large inheritances may hinge upon the official record of a

birth, marriage, or death ; and applications for transcripts of such records come even from foreign countries. This alone affords a reason for a State registration in addition to, and for the collation of, the local registrations made by the several boards of health in cities, villages and towns ; for when the exact locality in which a marriage, birth, or death, occurred is not known, the request for information is naturally directed to the State bureau.

The records of mortality and of the causes of death, though showing a great improvement in the organization of the local registration, fall far short of the completeness contemplated by the Public Health Act. Notwithstanding the prohibition of burials without a permit based upon a certificate of death, in many of the smaller communities, and, indeed, in some of the cities of the State, undertakers and others manage to evade the law, and very many deaths have thus remained unrecorded. Until April, 1884, it was found impracticable to attempt to compile the returns of deaths received at the office of the State Board of Health ; but since that date a monthly bulletin has been issued, which, despite its imperfections, has been of much service in stimulating sanitary work, and of appreciable service in estimating sanitary conditions. Three sources of fallacy, however, are to be borne in mind in the examination of these records :

Firstly, the difficulty in estimating the population of localities for any given year intermediate between the census enumerations is in many parts of this State insuperable by the methods applicable to older and more stable countries. So many fluctuating circumstances may cause an almost sudden increment or depletion that while one place gains inhabitants much more rapidly than the natural rate of increase, another is actually losing from year to year ; and it is probable that the coming census will show that in some instances an over estimate of population has apparently reduced the relative death rate, whilst in others the case has been reversed. Those local registrars who base their calculations upon the enumeration of 1880, are, of course, likely to do injustice to their respective cities or villages in computing a seemingly high death rate, if the deaths be fully reported.

But, *secondly*, it is probable that in many places the deaths are not fully reported, through inefficiency of organization or carelessness on the part of registrars ; and the greater the dereliction in this respect, the lower the apparent death rate, even if the population were exactly stated. Troy and Cohoes have afforded glaring exam-

ples of such defects in past months ; but their later returns manifest increased efficiency. For the reasons above mentioned, it has not been deemed expedient to frame estimates of population or corrected averages in the State bureau, but rather to give the local returns as received, with the understanding that the columns representing the ratio of deaths per 1,000 of population are not, in many cases, of any scientific value. The only tabulation offering data from which useful inferences can be drawn is the comparison of deaths from zymotic diseases with deaths from all causes, forasmuch as it may reasonably be assumed that deficiencies in the mortality returns affect nearly equally both classes of cases. With this regard, a glance at the last column of the appended table will show, even in places where the general death rate is low (and the statistics believed to be complete) an undue proportion of preventable diseases, which could be greatly reduced by efficient local sanitary administration.

	Population.	Deaths from all causes.	Representing annual rate per 1,000.	Deaths under five years.	Percentage of deaths under five to total deaths.	SEVEN PRINCIPAL ZYMOTIC DISEASES.						OTHER ZYMOTIC DISEASES.					Representing annual rate per 1,000 of population.	Ratio of deaths from zymotic diseases from all causes.
						Small-pox.	Measles.	Scarlatina.	Whooping cough.	Diphtheria and Croup.	Typhoid fever.	Diarrheal diseases.	Erysipelas.	Cerebro spinal fever.	Puerperal diseases.	Malarial fevers.		
New York	1,356,958	26,770	26.29	12,359	46.17	.....	660	431	405	1,432	335	3,516	6,779	133	270	390	7,596	283.86
Brooklyn	611,526	10,579	22.71	4,139	37.4	.....	71	130	107	450	90	1,910	2,929	5	143	234	5,945	305.38
Long Island City*	21,000	280	26.66	102	38.2	.....	2	2	3	29	3	46	57	2	12	8	61	8.67
Yonkers	22,000	283	13.94	489	38.3	.....	.....	.....	.....	.....	4	.....	55	3	.....	.....	64	3.87
Albany	67,344	1,669	26.12	783	38.0	.....	2	27	32	155	41	138	295	13	9	6	327	4.88
Schenectady	24,000	1,157	.....	401	59.4	.....	.....	.....	31	55	.....	.....	4	.....	.....	.....	161	22.2
Cohoes	6,000	650	.....	195	29.4	.....	.....	4	12	16	17	64	113	.....	2	.....	118	381.02
Troy	20,000	256	.....	105	41.0	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	131.54
Newburgh	20,000	298	.....	105	41.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	131.54
Poughkeepsie	20,207	298	.....	78	29.1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	253.90
Kingston	20,000	198	.....	64	32.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4.33
Hudson	20,000	151	.....	54	35.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3.23
Watkinsburg	10,000	174	.....	22.31	49	28.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4.12
Schenectady	13,675	215	.....	21.25	85	39.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	65
Utica	39,000	504	.....	225	41.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	49
Rome	12,045	130	.....	34	27.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3.23
Binghamton	20,000	235	.....	15.66	64	27.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	45
Elmira	25,000	178	.....	63	35.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	22
Syracuse	65,000	778	.....	17.15	33	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	22
Auburn	25,000	200	.....	251	32.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	62
Oswego	24,000	224	.....	82	28.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	45
Rochester	101,000	1,341	.....	13.00	26.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	43
Lockport	16,000	151	.....	39	25.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	287
Rest of State	2,644,155	45,713	.....	.....	.....	.....	751	634	701	2,309	598	6,351	11,344	194	519	634	12,866	281.23
		10,610	.....	.....	.....	.....	39	100	96	376	266	1,035	1,912	44	94	166	2,369	217.01
		56,343	.....	.....	.....	.....	790	734	797	2,685	864	7,386	13,256	299	613	800	15,165	269.12

* Returns not sent for June, July or November.

† For eight months.

‡ For six months.

§ Deaths under 5 not separated in April.

Thirdly, allowance must be made for possible errors of diagnosis by inexperienced practitioners, or faults of transcription by non-professional local registrars. It sometimes happens that, the immediate cause of death in a case of typhoid fever being a consecutive peritonitis or cardiac affection the latter is mistakenly certified as the "chief and determining" cause, and the death wrongly classified under diseases of the digestive or circulatory system in the returns sent for publication in the bulletin. In a similar way, deaths from measles may be recorded as pneumonia; from child-birth simply as peritonitis; and so of other maladies.

During the last three quarters of 1884 there have been reported to the State bureau of vital statistics 56,353 deaths from all causes. Of these, 13,256 or 23.5 per cent were caused by the "principal zymotic diseases." Small-pox, fortunately, is not to be ranked among the sources of mortality, the single entry ascribed to it in the November bulletin having been through a clerical error on the part of the local registrar. One non-fatal case was reported from Nyaack in June; but the patient was promptly isolated and no extension of the disease occurred. Several indefinite reports of the supposed existence of small-pox in places near the Canadian frontier were received during the autumn, but investigation proved them to be unfounded.

Scarlatina, with 734 deaths; measles, with 790; whooping cough, with 797, have prevailed chiefly in a few of the larger cities; New York and Brooklyn, as might be expected from their constant influx of immigrants, bearing the principal brunt. The mortality from these disorders, in proportion to the total number of deaths comprised in the reports, is lower than in most foreign places; but it could be much farther lowered if the people would co-operate with the sanitary authorities in adopting precautions to isolate the sick and prevent the spread of infection; and the record may be profitably pondered by those who regard measles and whooping cough as such trivial ailments that they wittingly expose their children to contagion.

Diphtheria has found a lodgment in nearly every part of the State, its ravages being committed in rural hamlets as well as in crowded cities, and counting, in nine months, 2,685 recorded victims.

The deaths certified as from Typhoid Fever numbered 864, and of these a larger proportionate ratio occurred in villages and rural districts than in the twenty-two cities. It is probable, moreover, that

some of the cases reported under the head of "malarial fevers" should have been added to this category.

Diarrhoeal diseases have caused 7,386 reported deaths, distributed almost impartially throughout the urban and rural districts.

The three last-named classes of maladies peculiarly typify "filth diseases;" their fatality being everywhere regarded as an indication of the pollution of air or water by the products of decomposition of organic (usually excremental) matter. Throughout the country the pernicious and barbarous custom exists of storing excreta and house-sewage in uncemented privy-pits and cess pools whose disgustingly foul contents percolate into the surface wells from which the water-supply is obtained. This evil is so intensified and multiplied as population becomes more dense, that it is scarcely an exaggeration to assume that nine-tenths of the wells in villages and unsewered or imperfectly sewered cities are dangerously contaminated. In the case of a public water-supply, the same peril, though perhaps in somewhat less degree, may arise from the pollution of streams by the discharge into them of crude, unpurified sewage by riparian communities. The imagined "self-purification" of running water has been shown by actual experiment to occur to a very limited extent, dilution and purification being far from synonymous from a sanitary standpoint, and Simon's apophthegm, that the essential requisite for a water supply is that it should be "uncontaminable by sewage," is as true to-day as when it was uttered a few years ago.

But it is not alone through drinking-water that a channel for "filth-poisoning" exists; nor is it logical to infer that a preponderance of "filth-diseases" necessarily indicates in a particular locality a contaminated water-supply. Pollution of the air of households, whether from faulty house-drainage or sewer-connections, or from the indraught of the "ground-air" from a filth-sodden soil, plays in many instances the chief part in the introduction and perpetuation of such maladies.

Cerebro-spinal Fever — a disease intimately associated with faulty house-drainage or filth accumulations — has shown itself in scattered districts in all sections of the State, its mortality record being 287. Erysipelas caused 209 deaths, and "malarial fevers" are credited with 800.

It is likely that some deduction should be made from the column headed "Puerperal Diseases" as the returns do not enable a distinction to be drawn between the zymotic and non-zymotic causes

of death after parturition. Forasmuch as in the population from which reports are received (about 3,270,000) at least 78,000 births occurred during the nine months, this lying-in mortality represents less than one death to 125 labors.

The deaths recorded, as has already been stated, do not show the total mortality of the State. Even making no allowance for deficient returns from some of the twenty-two cities, with their conjoined computed population of 2,644,155, and estimating the whole population of the State at but 5,350,000, we have a remainder of 2,705,845, which, if the annual death rate did not exceed seventeen per 1,000, would give for the nine months 34,499 deaths. Since not more than 10,640 have been returned to the State bureau, it is apparent that considerably more than 23,000 deaths have escaped record; and if the same ratio were maintained throughout, we should have more than 6,000 to add to the list of zymotic mortality.* Setting aside all speculations, however, the tabulation as it stands should afford both stimulus and encouragement to all local sanitary authorities; stimulus, in its indication of the imperative need of earnest and energetic life-saving work; encouragement in its demonstration that if the causes of easily preventable disease were abated, the remaining death rate would be very low. Experience abroad, where preventive medicine has been longer operative than here, has demonstrated that the reduction of mortality by efficient sanitation is almost exclusively confined to the recognized zymotic diseases and consumption. The relation of the latter malady to soil-saturation was long ago pointed out by Bowditch in this country and Buchanan in England, and its diminution where soil drainage and general hygienic conditions have been established is now a matter of history. From this one cause 7,879 deaths are reported in nine months, or nearly fourteen per cent of the whole mortality of the State. For the sake of comparison it may be stated that in the twenty eight large cities of England with an aggregate population of 8,762,354, the mortality in the past year from the principal zymotic diseases

* Out of 336 incorporated villages, 132 have organized boards of health; twenty-six admit the jurisdiction of their respective town boards.

Of the 947 townships, 539 have more or less efficient boards.

Constant efforts are being made by this Board to complete the sanitary organization throughout the State, and with growing success, the number of local boards in communication with the central office having been increased about twenty-five per cent during the past year; but it is evident that very much remains to be done, and in some localities more stringent legislation is required to compel the local authorities to fulfil their duty to the public in this respect.

(including, thanks to the mischievous machinations of the "anti-vaccination" fanatics, 1,264 deaths from small-pox) was but a fraction over sixteen per cent of the deaths from all causes, the conjoined ratio from diphtheria, "fever," and diarrhœa being less than eight per cent; while in London alone, with its more than 4,000,000 inhabitants, the general death rate was 20.3 per thousand of population; the zymotic mortality 3.3 per 1,000, or a little more than sixteen per cent of the total mortality; and the rate from diphtheria, fever and diarrhœa combined, under seven per cent of the deaths from all causes. The fact that in the State of New York, with better natural conditions for health and prosperity than obtain abroad, our mortality from but six out of the seven corresponding zymotic causes should be over twenty-three per cent, and from the three prominent filth diseases more than nineteen per cent of the total deaths, shows how much may be accomplished by persistent and scientific sanitary effort, and how much remains to be done by local authorities and by the State.

As regards the cost of such effort, Playfair in an address before the British Social Science Association in 1874, wisely said that, "Taking the smallest part of the money saving, it is obvious that money judiciously spent in sanitary improvement is not unproductive taxation, but capital bearing abundant interest," and an excellent paper by Dr. Jarvis on the "Political Economy of Health" in the report of the Massachusetts State Board of Health for 1874 fully substantiates this proposition. It is evident that whatever is earned beyond the cost of subsistence is so much added to the wealth of the community, and, taking the average of all classes, this surplus of production is estimated at a minimum of \$150 yearly per capita of the productive population between the ages of twenty and sixty-five. The death of an able-bodied or able-minded worker, therefore, entails upon the public fund a loss equal to the "present value" of an annuity of \$150 for the number of years which he lacks of sixty-five, and this, at six per cent, at the age of thirty-five, is somewhat over \$2,000. In the deaths of minors we lose, not only the prospective profit of their maturity, but the past cost of their maintenance, which Jarvis computes at fifty dollars per annum per capita. Counting these data in connection with the usual death rates at different ages, the average value of a human life to the community at large may be estimated as at least \$1,000. From this standpoint, our recorded preventable mortality (omitting puerperal deaths) has inflicted a loss to the State in nine months of over \$14,500,000. And this is not all, for if we

suppose a ratio of fifteen non-fatal cases to each death, we have 217,500 cases of preventable sickness, or, allowing twenty-one days as the average duration of each case from attack to complete recovery, 652,500 weeks withdrawn from active life. If but one-fourth of these cases occurred during the productive ages, and those only among the laboring class whose earnings did not exceed ten dollars per week, a loss would be represented of more than \$1,600,000 in wages alone, to say nothing of the other expenses attending illness. If one-half of this aggregate of death and illness could be prevented, the saving would pay six per cent on a capital investment of over \$130,000,000. Where sanitary improvements have been effectively carried out, a reduction in the death rates of different places has been achieved of from eighteen to thirty-two per cent, and such reduction, as before stated, has chiefly concerned the zymotic disorders; by means of proper sewerage, drainage and general hygienic precautions, the mortality from typhoid fever alone has been lowered thirty to seventy-five per cent, and that from consumption nearly fifty per cent in some localities. The ignorant outcry against the comparatively small expense of sanitary administration is senseless from a merely pecuniary point of view, and there is no community so poor that it should be unwilling to procure the best attainable talent and knowledge in its local sanitary organization. Moreover, local health officers and boards of health should bear in mind that their duties are not fulfilled in waiting until disease has actually arisen; their functions are preventive, and the very purpose of their office is to abate the causes of death before the effect is manifested. For this purpose the law gives ample powers, and the trust imposed is one involving a solemn responsibility. Particularly in face of a possible importation of cholera is it important that the duties of the local authorities should be conscientiously and energetically performed; and the work thus done will in no case be wasted. The Asiatic scourge is not contagious from the person; its seed must find a soil outside the body to multiply in, and this soil is filth. The index to the potential ravages of imported cholera in any given locality is the endemic presence of typhoid fever and diarrhoea; and the measures adapted to repel the exotic pestilence will bear their fruit in preventing the latter diseases also. Purity of water, soil and air—the prompt and thorough removal of all sources of pollution by decomposing organic filth—will deprive foreign or domestic epidemics of all their terrors.

In many parts of the State, especially in the clayey regions of the

glacial drift, malarial disorders are rife, crippling productive industry, even though the direct mortality from them be comparatively small; and in some counties vast areas of swamp lands exist, requiring outfall works beyond the power or means of local authorities. That thorough soil drainage will abate malarial fevers is a fact placed beyond conjecture or argument; how such thorough drainage is to be accomplished in some of our paludal districts is a sanitary problem apparently insoluble without the intervention of the State. Apart from the natural marsh lands, in various smaller districts artificial malarial influences have been created by the injudicious action of municipalities or private land owners in obstructing drainage-channels or water-courses, and thus inducing soil-saturation where nature had provided healthful conditions. Ill-graded roads, railway embankments, and selfish private greed, have, in numerous instances, thus done injury to originally salubrious places, and in some examples the mischief seems to be irreparable by any measures within the reach of the people injured. With an accurate topographical map it would be possible to fix upon certain natural drainage channels, which neither public nor private operations should be allowed to impede, and the increased taxable value of the lands so protected or relieved, would far more than compensate for any outlay involved.

The influence of defective school hygiene, both in construction and management, is a subject deserving the careful consideration and watchful care of boards of health, as it affects the welfare of coming generations. During the susceptible age of development, children are often exposed to dangers from insufficient cubic space and ventilation which may call into destructive action latent hereditary tendencies that might otherwise have been surmounted, or, without directly imperilling life, may induce an irremediable and life-long impairment of vitality. In not a few instances, superadded pollution of soil by faulty conservancy systems or other causes, pervious basements inviting the ingress of poisoned ground air, or contamination of water supply, have led to more rapidly disastrous results. The proposal to build a public school upon an abandoned burial ground at Port Jervis, and the investigation of an outbreak of diphtheria in a school at Lansingburgh, both of which will be found in the Appendix, afford examples of risks of this sort, which, in minor degree, exist in numerous localities. Much good has been accomplished in this respect through the efforts of this Board, based upon the inspection and report of Dr. Lincoln, published in the Second Annual Report of the Board, and circulated

widely in separate form ; but very much yet remains to be desired, and the general attainment of the needed end should be zealously promoted by all local sanitary authorities. Aside from the question of school buildings, much mischief is occasionally inflicted on delicate children by injudicious methods of discipline, entailing violation of the demands of nature, or punishments consisting in prolonged constrained attitudes, or privation of food, exercise or fresh air.

The agency of school intercourse in disseminating infectious diseases is everywhere recognized, and in all well-ordered sanitary districts a rule exists prohibiting the return to school of any pupil convalescent from a contagious febrile disorder, without a medical certificate that the risk of infection is past. Few recorded data afford grounds to determine the duration of such risk, or to justify a positive answer to the inquiries of local sanitary officers and practitioners ; the only recent attempt at an arbitrary tabulation of the respective periods of infectiousness having been by Dr. Miller, of Dundee,* as follows :

Small-pox, fourteen days after termination of scabbing.

Typhus, twenty-eight days from inception.

Scarlet fever, seven weeks from inception.

Diphtheria, six weeks from inception.

Whooping cough, eight weeks from inception.

Measles, six weeks from inception.

In order to ascertain if there were any consensus of opinion among those whose opportunities for observation had been great, the subjoined circular was sent to a number of College Teachers and Hospital Physicians.

STATE BOARD OF HEALTH OF NEW YORK, }
ALBANY, April 10, 1884. }

DEAR DOCTOR — A question of great practical moment, often asked by local Health Officers and School Trustees, is, at what period after an attack of one of the acute infectious diseases it is safe to re-admit the patient to school or other public intercourse.

It will be esteemed as a great favor if you will briefly state the results of your observation as to the probable duration of personal contagiousness (excluding, of course, portation by infected clothing or other fomites) in cases of small-pox, diphtheria, scarlatina, measles, whooping cough, or typhus.

Faithfully yours,

ALFRED L. CARROLL,

Secretary

* *British Medical Journal*, No. 1074, p. 173.

In response to this, nine replies were received, all but one of which are here appended in chronological sequence.

NEW YORK, *April 10, 1884.*

DEAR DOCTOR — The time during which children who have had the contagious diseases mentioned in your note should be kept at home varies with each disease. The contagium of measles is very volatile, and does not long remain attached to the person or clothing, so that a child recovering from it can safely return to school in two weeks after convalescence; that of scarlet fever remains long attached to the person and clothing, and a child recovering from it should not return to school under eight weeks, and not till all desquamation has ceased and his person and clothing have been disinfected. How long whooping cough is contagious has not been determined, but its contagiousness has probably ceased in the third stage, when the cough is no longer spasmodic and is infrequent. The poison of diphtheria also has a tenacious hold of the individual. I should say that he should be kept at home a month, or, at any rate, three weeks after all the symptoms have abated, and his person should be disinfected. No child who has had diphtheria should return to school as long as there is any redness of the fauces or coryza.

Small-pox we have now no experience with in New York; it is so nearly "*stamped out*;" but it is well known that its specific principle is firmly attached, for months even, to clothing, books, or furniture upon which it happens to lodge, so that at least eight weeks should elapse and thorough disinfection be practiced before a child that has been affected with it should be allowed to return to school. Children recovering from typhus and typhoid fevers might return to school after complete recovery and disinfection.

Yours truly,

J. LEWIS SMITH, M. D.

NEW YORK, *April 11, 1884.*

MY DEAR SIR — The time which should elapse in order for security against diffusion of the contagion after recovery from the contagious infectious diseases, of course, varies in the different diseases.

In typhoid fever, as the contagion is exclusively (as supposed) in the dejections, there is no danger as soon as convalescence is complete.

In typhus fever, erysipelas, small-pox, scarlet fever, and measles, the specific germs emanating from the body, there is danger for a certain period after convalescence or even recovery. The duration of the period of danger varies in these diseases. I know of no better rule than that the danger is not to be considered as extinct until all traces of the cutaneous affection have disappeared, and every thing has been removed from the surface of the body by repeated baths or ablutions. This rule seems to me better than any stated average period of time.

Very truly yours,

418 FIFTH AVENUE.

A. FLINT.

NEW YORK, *April 11, 1884.*

DEAR SIR — I cannot answer your question definitely, except in the case of scarlet fever. Regarding that, Dr. Cheeseman had the care of two children, a girl attacked by scarlet fever who was separated from her brother, staying at the house of an aunt. At the end of six weeks Dr. Cheeseman inquired if intercourse between the children was permissible. I told him to wait as long as he could. He, however, in a few days permitted the sister, after changing her clothes, to see her brother — playing together and kissing each other. The girl remaining at her home, four days afterward the boy was attacked by scarlet fever symptoms. This is one instance showing the danger after an interval of six weeks, the only one where I marked the time exactly. I have no definite facts in regard to other diseases, but I suppose small-pox to be contagious until the healing is complete and the cicatrices are fully healed. Measles are probably contagious for a week at least after the desquamation. As to diphtheria, I doubt its communicability save by contact. Whooping cough is a disease that I have not seen much of. Typhus fever I do not regard as contagious after a short interval.

Yours, truly,

A. CLARK.

.1700 WALNUT STREET, *April 13, 1884.*

DEAR SIR — I regret that I have not the time to answer such comprehensive questions. With reference to small-pox, however, I may say that no communication should take place until every scab has been removed from the body, and frequent baths have been taken.

Very truly yours,

F. M. DA COSTA.

65 MARLBOROUGH STREET, BOSTON, *April 13, 1884.*

DEAR SIR — In reply to your letter of the 10th instant, I would say that, as far as my observation goes, I think the rule adopted by the board of health of this city, in cases of acute infectious diseases, is reasonable and safe, viz.: That four weeks should elapse from the beginning of the last case of disease in the family before a patient should be allowed to attend school.

Yours respectfully,

FRANCIS MINOT, M. D

NURSERY AND CHILDS' HOSPITAL, S. I., *April 14, 1884.*

DEAR DOCTOR — The result of my observation and experience with regard to the probable duration of contagiousness in the zymotic diseases mentioned in your letter of inquiry are as follows: In scarlatina I should have no fear of contagion after desquamation had entirely ceased, and the person had been thoroughly disinfected.

In measles the same holds good, except in cases where no desquamation occurs; the latter I quarantine for twenty-one days. In whooping cough my observation has been that it ceases to be contagious after the cough has lost its spasmodic character. Observation of quite a large number of cases of diphtheria has led me to believe that it is *feebly*, if at all, contagious; and, after the disappearance of membrane, I should consider it entirely safe out of quarantine. I have no experience with either small-pox or typhus worth recording.

Very truly yours,

ANNA LUKENS, M. D.,
Resident Physician.

NEW YORK, *April 16, 1884.*

DEAR DOCTOR — I am very glad you have raised the interesting question which prompted your note, and hope you will be able to arrive at more definite conclusions than we possess at present.

I do not think we can designate a set period for all cases, but looking upon the infective principle of *scarlatina* as a virulent particle thrown off from the body during the disease, and chiefly adherent to the skin, I am of the opinion that *after desquamation has ceased*, and thorough disinfection of person and premises practiced, the patient may again be admitted "to school or other public intercourse."

A similar principle holds with regard to other diseases on your list, varying our treatment with what we know of the *preference* which these poisons seem to show for certain organs of the body. I speak more definitely of scarlatina because my opinion is formed concerning the quarantine to be observed in the disease.

Very truly yours,

F. A. BURRALL.

April 26, 1884.

DEAR SIR — Please to accept my apology for not answering your note of April 10, long ago.

In answer to your questions as to the duration of contagiousness I will state that I claim scarlatina to be contagious as long as desquamation lasts. Forty days are sufficient. Now and then there are cases in which it appears to last very much longer. But that is no longer scarlatinal in character, but the result of dermatitis in general, in a skin which has not regained its original health, without its being the seat of an infectious or contagious process.

Measles require eighteen days; diphtheria is contagious until the last trace of inflammation or ulceration secondary to, or attending the diphtheritic process has disappeared; the time is uncertain. Whooping cough ceases to be contagious with the *spasmodic* cough, but is so already before it sets in, that is during the two or three weeks of catarrhal premonitory stage. Variola during the whole of its desquamation.

Very truly yours,

A. JACOBI, M. D.

The remaining answer is from an eminent sanitarian whose name is by his request withheld, but whose views may be thus briefly summarized: (1.) That in small-pox the danger is past when all crusts are gone and the body and hair have been thoroughly cleansed, a doubt being expressed, however, whether there be much danger from the crusts which are found under the thick skin of the palms and soles. (2.) That in whooping cough the breath is the sole vehicle of contagion, and that it cannot be stated how long the cough is dangerous to others. (3.) That measles ceases to be contagious when the febrile stage and the eruption are past. (4.) That as regards scarlatina and diphtheria, if fomites and all extraneous sources of filth-poisoning be excluded, their personal contagiousness is open to question.

Since the issue of the circular of inquiry above mentioned, an useful "Code of Rules for the Prevention of Infectious and Contagious Diseases in Schools," has been published by Dr. Alder Smith, secretary of the English Medical Officers of Schools Association, in which after much judicious discussion of general questions of school hygiene, as regards the point immediately at issue, the duration of contagiousness, it is assumed that a pupil may rejoin the school, "after scarlet fever, in not less than six weeks from the date of the rash, if desquamation have completely ceased; measles, in not less than three weeks from the date of the rash, if all desquamation and cough have ceased; German measles, in two or three weeks, the exact time depending upon the nature of the attack; small-pox and chicken-pox, when every scab has fallen off; mumps, in four weeks from the commencement, if all swelling has subsided; whooping cough, after six weeks from the commencement of the whooping, provided the characteristic spasmodic cough and the whooping have ceased, or earlier, if all cough has completely passed away; diphtheria, in not less than three weeks, when convalescence is completed, there being no longer any form of sore throat, or any kind of discharge from the throat, nose, eyes, ears, etc., and no albuminuria." Although these rules are based upon the collective opinions of a number of medical officers of schools, their indefiniteness shows how little certainty as yet exists on the subject. In measles, for example, a consecutive bronchial cough may endure for many weeks after the most scrupulous physician would imagine any risk of infection to linger; and in other instances the numerous "ifs" relegate to private responsibility the determination of the problem in each individual case. So evident is this lack of certitude that a reviewer in

the *British Medical Journal* advocates for practical purposes the virtual abandonment of scientific distinctions, and to adopt the following arbitrary rules:

“(a.) No pupil who has been exposed to the infection of any contagious malady shall be admitted to a school until after the expiration of four weeks from the date of such exposure.

“(b.) No pupil who has been ill of any contagious malady shall be admitted to a school until after the expiration of six weeks from the date of the appearance of the symptoms, and then only on the production of a medical certificate.”

The diversity of opinions expressed by those who have had the largest opportunities for observation renders it evident that much farther accurate inquiry is needed before satisfactory conclusions can be reached. Meanwhile, the period of quarantine in the commoner exanthematic fevers may apparently be safely limited by the duration of desquamation, where this occurs, and in whooping cough by the persistence of the spasmodic character, leaving diphtheria as a vexed question, concerning which no data are afforded in the present state of our knowledge.

Of course, the agency of infected clothing and other fomites is to be considered in the spread of contagious diseases through school intercourse, and the person, properties, and surroundings, should be thoroughly disinfected before return to school is permitted, even after the longest interval assigned to corporal contagiousness.

Another possible injury to health during the period of growth lies in the employment of children in factories of different kinds. It is difficult, however, to frame laws which shall equitably guard adolescence from physical harm without inflicting hardship in many cases where the loss of even small earnings may lead to more serious privation. In such cases an arbitrary limit of age can hardly be established, since—setting aside certain industrial processes which are essentially dangerous to health—it is evident that in a very large number of instances individual characteristics must determine the permissibility of specified work, a feeble person of eighteen or nineteen being unfit for an occupation which might be harmless for a younger but more robust youth. This subject has enlisted the earnest attention of the Superintendent of the Bureau of Labor Statistics, in reply to whose inquiry a letter was written by the Secretary, a copy of which is hereafter appended.

Much to the regret of the Board, it has been impossible to take action under the statutes relating to the adulterations of food and

drugs and to explosive illuminating oils, no appropriations having been made for these purposes since the first passage of the acts in question. The investigations and reports published under chapter 407 of the Laws of 1881 indicate the extent and importance of the labor required to protect the public from adulterations and falsifications of dietetic and medicinal articles, and it is hoped that means may be afforded for the earnest prosecution of this much needed work.

ENGINEERING.

The engineering work of the Board during the past year has been very extensive. The cases which have required examination and sanitary engineering aid may be classified under the following heads:

1st. Cases where the State is alleged to be maintaining a nuisance on its property, or where State works have so interfered with channels of natural drainage as to cause a nuisance.

Where localities believe that the health of the people is being injured by the action of the State, appeal is usually made to the State Board of Health to examine the alleged unsanitary conditions. These appeals are generally made to the Governor, who orders the State Board of Health to make the necessary examination to determine whether or not the nuisance exists and to suggest remedies therefor. Almost all these complaints involve mixed sanitary and engineering questions and the best remedy is sometimes very difficult to determine. On the receipt of complaints of this character the Board sends an engineering inspector, and if necessary a medical inspector also, and if the evidence is clear that the State is maintaining or causing a nuisance injurious to the health of the locality, the engineer is directed to prepare a report thereon containing plans for the remedy of the evil.

In case it is found that the State is not responsible for the unsanitary condition complained of, or that ill health arises from some other cause than the one alleged, report is made of the facts. The report of the experts is submitted to the committee on drainage, sewerage, and topography and either approved, modified, or disapproved. The committee then makes a report to the Board containing its official conclusions and recommendations. If this report is approved by the Board, it is transmitted to the Governor, in case the reference is from him, and copies of the report are forwarded to the locality interested.

There are a number of cases under this head which have been before the Board during the past year. The reports of the Board

furnish reliable basis for remedial legislative action where localities claim injury to health from the public works of the State. They also give protection to the State from unjust demands on the part of localities. A notable example of this was in the case of the Oak Orchard Swamp where claims for thousands of dollars were made against the State on account of the alleged damage from the canal feeder. The work of the State Board of Health and the State Survey combined proved conclusively that the evils complained of were due to natural causes and not to the canal. Without a topographical map of this locality made by the State Survey it could not have been known that the State was not to blame for the serious damages to property which often occur in that region.

The second class of cases which the work of the Board embraces are those where it has been previously determined that the State was responsible for a nuisance and where the appropriations have been made by the Legislature for the abatement of such conditions by the Superintendent of Public Work under the advice and direction of the State Board of Health. These works being exclusively for a sanitary purpose the State Board of Health is held responsible that the plans adopted and their execution shall meet the sanitary end in view.

When such responsibility is placed upon the Board by the Legislature, engineering inspection is made of the locality and a detailed plan prepared for the execution of the work. In some cases, as in the case of the abandoned Chemung canal at Horseheads, it has been necessary for the Board to keep its engineer on the ground during the execution of the work, in order to adapt the plan to contingencies which were constantly arising. The work done under this head during the past year has been of great benefit to the localities interested, and has been executed with unusual economy.

The general policy of the Board with regard to nuisances, for which the State is responsible, is that they ought to be remedied in a thorough and permanent manner. If the State is maintaining a nuisance on its property or causing a nuisance on the property of others, it is setting a very bad example to all citizens and corporations.

The third class of cases is that in which railway corporations or large manufactories have either built structures or are carrying on operations in such a way as to seriously endanger the health of certain localities. In many cases the railways of the State have

built large embankments in such a manner as to seriously interfere with the natural drainage of the neighboring land. The railroads pay little heed to remonstrances of local boards of health on questions of this kind, and the localities have often found it necessary to invoke the aid of the State Board of Health.

In some instances it has been found that the railroads were not the cause of the sickness complained of, while in other cases there has been no doubt of their responsibility. Where their responsibility can be clearly shown by the impartial investigations of the State Board of Health, the railroads are inclined to follow the advice of the Board in remedying these evils, although in some cases an order from the Governor has been found necessary to secure the required reforms. The same may be said of the manufacturing interests which have been complained of.

The fourth class of cases are those which arise from the alleged influence of the acts of one town upon the health of citizens of another. Local Boards of Health, feeling that the health of the citizens of their community is affected by causes outside of their own jurisdiction appeal to the State Board for redress. The most important of these cases relate to sewage disposal, the contamination of water supplies and the saturation of soil by the backing up of ground or surface water.

Some very important cases have arisen during the past year, involving the sanitary influence of one town upon another, requiring thorough and most careful investigation by sanitary and engineering experts, and as the result of the studies of the committee in that direction two extremely important laws have been prepared and submitted to the Legislature, one to provide for the protection of potable water supplies of the State, and the other to promote the construction of outfall channels for drainage of the larger swamps.

The present laws are clearly inadequate to protect potable water supplies from such contamination as may occur by the pollution of the ground-water in the neighborhood of these supplies. The question of the protection of potable waters to prevent the germs of disease from being carried into them in sufficient quantities to endanger the health of the community which uses it, is one of the most difficult which sanitary engineering science is forced to contend with. An act that may be perfectly harmless in one locality, under other conditions is liable to be dangerous to the purity of the water. So varied are the circumstances which surround the source of different water supplies that the Board has found it impossible

to frame a general law, which would afford efficient protection to all without placing unnecessarily burdensome restrictions upon some. They have therefore proposed that the legislature empower the State Board of Health to make rules and regulations for the protection of each separate potable water supply.

In the matter of the drainage of the great swamps, the investigations of the Board show that many thousands of people are suffering either from absolute illness or from debility due to miasmatic influence of the great swamps in the State. The aggregate number of cases of illness due to this cause is enormous. Under the existing laws little or nothing can be done toward the drainage of the great swamps of the State, the total acreage of which is supposed to be from two hundred to two hundred and fifty thousand acres.

Experience has shown that the localities are utterly unable to cope with the problem of the draining of extensive areas. The committee has recommended that the State loan to the localities the sums necessary to execute the drainage works, the plans for such works being approved by the State Board of Health. The repayment of this loan is to be from assessments on the property benefited ; but none of these assessments are to be made for five years after the improvement is completed and ten years is then to be given for the repayment of the whole loan, the purpose being to make the repayment of the loan as easy as possible to the people, since they will not be called upon for any payment until the land has been reclaimed and made productive.

It is believed that under this system, which is but a modification of that so successfully practiced in England, the great swamps of the State may be reclaimed, millions of dollars worth of productive land added to the wealth of the State, and the lives and health of thousands of its citizens saved.

The fifth class includes cases where the local authorities desire the advice and assistance of the State Board of Health in sanitary matters pertaining to their localities, because questions have arisen which require more technical sanitary knowledge than they can command and where the citizens desire the advice of some authority in such matters which they believe both competent and impartial. This class also includes cases in which local authorities are not inclined to act in the matter of sanitary reform and where bodies of citizens, believing that grave evils threaten the community, appeal to the State Board in order to compel the local authorities to do their duty.

In no way has the work of the State Board of Health been more

effective during the past year than in giving the needed advice regarding thesewerage and drainage of the towns and villages of the State. It is not the purpose of the Board to make detailed plans for the sewerage and drainage of localities where the State has no responsibility for the unsanitary conditions. The State Board is generally called on to advise in a general way as to the necessity for sewerage or drainage in a special locality, as to the advisability of this or that method of sewerage, and as to the sanitary effect of various proposed methods of sewage disposal.

There are generally several factions in localities, each taking different views regarding these matters, who are often willing to submit their differences to the decision of an impartial Central Board. The purpose of the Board is to use its rapidly accumulating experience to assist localities in determining in a preliminary way as to the necessity for sewerage or drainage works and as to the general character of the work needed to meet the wants of the locality; leaving to the community itself to secure its own engineer and make its own plans to carry out the general recommendations of the Board.

In certain cases where several communities are involved in the work and where the sanitary problem is difficult, it has been necessary to state quite specifically what remedies should be applied for the serious evils which were found to exist. The purpose of the Board is not to do for localities that which they can do for themselves, but to help them by advice as to those matters which require more experience and technical knowledge than any locality is likely to command.

In this preliminary advice in regard to sewerage and drainage works, the recommendations of the Board are felt by the friends of sanitary reform in the locality, to be more effective in overcoming opposition than the advice of some private engineer would be, because of the official weight which it carries and the certainty that it is disinterested.

It is believed that during the past year the State Board of Health has accomplished a very large amount of good by responding to numerous appeals for advice and assistance in determining the necessity and general character of sewerage and drainage works.

In the appendix will be found the reports in detail which have been made in response to these requests and appeals. Every effort is made by the Board to keep thoroughly abreast with the most recent knowledge regarding the experience of other States and countries in sewerage and drainage works. The question of sewage

disposal is receiving constant and thorough examination in view of the difficulties which are arising in this matter and which are sure to rapidly increase.

FINANCIAL.

As will be seen by reference to the report of the executive and finance committee, the expenses of the Board during the past fiscal year have exceeded the amount of its appropriation, the sum voted by the Legislature for the prosecution of its work being but \$20,000, while the actual expenditures foot up to \$21,971.36.

Fortunately, an unexpended balance to its credit at the beginning of its last fiscal year enabled the Board to discharge its obligations without incurring indebtedness; but the large growth of its registration work and the unprecedented demand for its engineering and sanitary counsel warn the Board of threatened financial embarrassment during the coming year unless the \$20,000 granted by the last Legislature for the continuance of its work is supplemented by a suitable subsidy in the supply bill.

Urgent appeals are frequently received from local boards of health and citizens of various parts of the State for advice and assistance in questions of supreme moment to public health, requiring for their elucidation skilled sanitary inspection and often exact analytical examination. As far as the pecuniary resources of the State Board have permitted, prompt response has been made to such appeals; but as they increase in number lack of means compels reluctant neglect of some of them. Furthermore, under the duties imposed upon the Board, to "make inquiries in respect to the causes of disease, and especially of epidemics, and investigate the sources of mortality, and the effects of localities, employments, and other conditions upon the public health," it is evident that a system of sanitary investigation was contemplated far beyond the present possibility of attainment, but absolutely needful to enable it to take "cognizance of the interests of health and life among the people of the State." Toward the fulfillment of these, the most important duties of the Board, the sum of \$15,000 is asked, and even with this, in view of a threatened epidemic visitation, the demands upon the Board during the coming year will probably exceed its powers of compliance.

The regular appropriation of \$20,000 barely suffices to defray the expenses incident to the reception, recording, filing and indexing of the State vital statistics at the central office, together with the voluminous correspondence necessitated by the wide range of questions constantly referred for reply.

EFFLUVIUM NUISANCES.

Under direction of the Governor, and in response to appeals from citizens suffering from their injurious effects, inspectors have been employed to the extent of the Board's limited means; but here again it has been crippled for want of resources. Offensive businesses have continued particularly during fogs and under cover of night. Nothing short of a corps of inspectors on duty both night and day can bring about that degree of vigilance necessary for the successful detection and correction of these pernicious practices.

Details of the work in this direction will be found in the appendix.

QUARANTINE.

The report on quarantine reveals the startling fact that under existing statutes but four diseases are quarantinable, viz.: small-pox, cholera, yellow fever and typhus fever. The health officer of the port has no power to prevent the free entrance into the State of patients suffering from diphtheria, scarlet fever, measles or typhoid fever. Additional legislation is recommended by the Board to extend his powers to all infectious diseases, and to require clean bills of health from masters of vessels. Another serious difficulty confronting the efficient administration of quarantine is to be found in the fact that the health officer has no power or means provided to detain, during period of incubation, persons who refuse to be vaccinated. The surgeons of vessels are thus encouraged in an indifference to the sanitary safety of the passengers, which would speedily disappear were the financial interests of the consignees in any manner jeopardized. Some practical suggestions for meeting this and other weaknesses of the quarantine law will be found in the regular report in appendix.

Respectfully submitted.

EDWARD M. MOORE, M. D.,
President.

ERASTUS BROOKS,
J. SAVAGE DELAVAN, M. D.,
GEORGE W. COOKE, M. D.,
WOOLSEY JOHNSON, M. D.,
ALFRED MERCER, M. D.,
DENIS O'BRIEN,

Attorney-General.

WM. M. SMITH, M. D.,
Health Officer of Port.

JAMES T. GARDINER,
Director of State Survey.

ALFRED L. CARROLL, M. D.,
Secretary.

*Members of State Board
of Health.*

FINANCIAL EXHIBIT.

Financial exhibit for year, October 1, 1883, to September

30, 1884, total \$21,971 36

Made up as follows :

For members' traveling expenses.....	\$1, 726 65
For salaries and wages	11, 651 97
For expert services	2, 771 89
For miscellaneous expenses	1, 863 97
For furniture	518 84
For expressage and telegraphing.....	180 79
For printing and stationery	2, 944 96
For library	282 88
For unclassified payments	29 41
	<u>\$21, 971 36</u>

Balance unexpended October 1, 1883..... \$8, 585 43

Special appropriation for year

	<u>20, 000 00</u>
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\$28, 585 43

Deduct above expenses

	<u>21, 971 36</u>
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Leaving a balance October 1, 1884, of \$6, 614 07

The details of this expenditure are given below.

TRAVELING AND NECESSARY EXPENSES OF MEMBERS.

1883.

Oct. 25. Erastus Brooks, per itemized account	\$87 01
25. Dr. Edward M. Moore, per itemized account.	80 20
Nov. 9. James T. Gardiner, per itemized account....	19 46
15. James T. Gardiner, per itemized account....	9 00
15. J. Savage Delavan, per itemized account	39 20
20. James T. Gardiner, per itemized account....	13 45

1883.

Nov. 21.	Wm. M. Smith, per itemized account.....	\$38 05
21.	James G. Hunt, per itemized account.....	42 84
Dec. 1.	James T. Gardiner, per itemized account....	26 40
9.	James T. Gardiner, per itemized account....	22 10
23.	James T. Gardiner, per itemized account....	26 00
	Erastus Brooks, per itemized account.....	21 75
26.	Elisha Harris, per itemized account.....	692 60

1884.

Feb. 20.	Wm. M. Smith, per itemized account.....	13 60
Jan. 20.	Erastus Brooks, per itemized account	44 29
Mar. 12.	J. Savage Delavan, per itemized account....	12 45
	Dr. Edward M. Moore, per itemized account.	109 60
13.	James T. Gardiner, per itemized account....	12 55
April 4.	Alfred L. Carroll, per itemized account	19 25
	James T. Gardiner, per itemized account ...	18 25
29.	James T. Gardiner, per itemized account....	30 52
	James G. Hunt, per itemized account.....	17 10
May 17.	James T. Gardiner, per itemized account....	34 17
21.	Alfred L. Carroll, per itemized account	24 49
	Wm. M. Smith, per itemized account.....	28 20
	Erastus Brooks, per itemized account	38 94
31.	George W. Cooke, per itemized account.....	16 68
31.	Alfred L. Carroll, per itemized account	25 53
	E. M. Moore, per itemized account.....	42 28
June 24.	James T. Gardiner, per itemized account....	10 05
	James T. Gardiner, per itemized account....	10 00
July 27.	J. Savage Delavan, per itemized account....	18 71
	Erastus Brooks, per itemized account	38 45
Sept. 9.	Geo. W. Cooke, per itemized account	26 93
16.	James T. Gardiner, per itemized account	116 55

\$1,726 65

SALARIES AND WAGES.

1883.

Nov. 1.	Salaries for October	\$879 66
Dec. 1.	Salaries for November.....	966 33

1884.

Jan. 1.	Salaries for December	966 33
Feb. 1.	Salaries for January	966 33

1884.

Mar.	1.	Salaries for February	\$688 00
April	1.	Salaries for March	708 32
May	1.	Salaries for April	1, 143 69
June	1.	Salaries for May	1, 066 66
July	1.	Salaries for June	1, 066 66
Aug.	1.	Salaries for July	774 99
Sept.	1.	Salaries for August	774 99
Oct.	1.	Salaries for September	1, 650 01
			<hr/>
			\$11, 651 97
			<hr/>

SPECIAL EXPERT SERVICES.

1883.

Oct.	20.	J. W. Holmes, for surveys on Oak Orchard swamp	\$19 00
	30.	E. G. Love, for butter analyses	105 00
Nov.	3.	Arthur Hollick, for inspections at Glen Cove, etc.	40 00
	3.	N. L. Britton, for examination of algæ, slimes, etc.	25 00
	3.	Charles E. Munsell, for inspections at Glen Cove	40 00
	3.	Willis G. Tucker, for testing kerosene, etc. . .	15 00
	3.	S. A. Lattimore, for services as public analyst, per account	48 00
	3.	Emil Kuichling, for services as sanitary engi- neer	72 50
	12.	J. W. Holmes, for surveys on Oak Orchard swamp	132 00
	22.	Dr. F. C. Curtis, for services as medical in- vestigator	15 00
	22.	Edward W. Martin, for examination and re- port on adulterated cheese	50 00
		Dr. R. M. Moore, for medical inspections . . .	50 00
Dec.	1.	Emil Kuichling, for services as sanitary engi- neer	86 50
	3.	S. A. Lattimore, services as public analyst . . .	8 00
	4.	Arthur Hollick, for inspections at Glen Cove,	30 00
	4.	Edwin P. Clark, for services as nuisance de- tective	32 00

1883.

Dec.	6.	N. L. Britton, for examination of algæ, etc., at Glen Cove.....	\$20 00
	6.	E. G. Love, for analyses of butter, etc.....	50 00
	7.	Charles E. Munsell, for inspections at Glen Cove	35 00
	20.	Dr. J. S. Cooley, for investigating prevalent diseases.....	50 00
	20.	Dr. F. C. Curtis, for services as medical investigator.....	36 00
	20.	Arthur Hollick, for services as inspector, per account.....	30 00

1884.

Jan.	3.	G. C. Caldwell, for testing kerosene	12 00
	4.	S. A. Lattimore, for testing car oil.....	5 00
	4.	Dr. F. C. Curtis, for medical investigation at Cobleskill.....	6 00
	4.	Richard Prescott, for services as sanitary engineer	10 00
	24.	Dr. Wm. Govan, for investigating typhus among railroad laborers.....	20 00
	25.	Dr. A. L. Carroll, for money to pay for tracing map of Staten Island.....	15 00
	25.	Dr. T. B. Cooley, for collecting suspicious oil samples.....	4 89
	25.	W. G. Tucker, for testing kerosene.....	78 00
Feb.	4.	W. G. Tucker, for testing kerosene.....	69 00
	11.	Dr. J. H. Hunt, for services in the investigation of typhoid at Port Jervis	11 00
	23.	J. W. Holmes, for surveys at Oak Orchard swamp	276 00
	23.	Dr. Eugene Beach, for investigating enteric fever in Fulton county, etc.....	52 00
	27.	Arthur Hollick, for services as sanitary inspector	30 00
Mar.	3.	S. A. Lattimore, testing kerosene.....	6 00
		S. A. Lattimore, analyzing butter, candy, etc.,	45 00
	7.	Arthur Hollick, services as sanitary inspector,	10 00
	8.	Dr. F. C. Curtis, for medical inspection at Yorktown	14 00
	8.	Arthur Hollick, for sanitary inspection on Staten Island.....	10 00

1884.

Mar.	12.	G. C. Caldwell, for services as public analyst,	\$22 40
May	1.	Arthur Hollick, for services as sanitary in- specter	37 70
	8.	Horace Andrews, C. E., for drawing maps, etc.	14 00
	15.	G. C. Caldwell, for services as public analyst,	50 00
	20.	Horace Andrews, C. E., for tracing map of Port Jervis	13 90
June	7.	Arthur Hollick, for services as nuisance in- specter	15 00
July	9.	Arthur Hollick, for services as nuisance in- specter	15 00
	11.	W. G. Tucker, for services as public analyst,	61 00
	16.	Horace Andrews, C. E., for services as sanitary engineer.....	90 00
	24.	Dr. Eugene Beach, for services in investigat- ing trichinosis at Arietta.....	30 00
Aug.	6.	Dr. Wm. Hailes, for microscopic examination of human muscle for trachina.....	50 00
	7.	Arthur Hollick, for services as sanitary in- specter	35 00
Sept.	5.	Horace Andrews, C. E., for services as sanitary engineer.....	150 00
	5.	Horace Andrews, C. E., for services as sanitary engineer.....	100 00
	5.	O. S. Wilson, C. E., for services as sanitary engineer.....	300 00
	12.	Dr. F. C. Curtis, for investigating cholera asphyxia at Hoosick Falls.....	5 00
	15.	Arthur Hollick, for services as inspector.....	10 00
	23.	Horace Andrews, for services as sanitary engi- neer	110 00
		Dr. R. M. Moore, investigating epidemic at Lockport	50 00
			<hr/>
			\$2,771 89
			<hr/>

MISCELLANEOUS EXPENDITURES.

1883.

Nov.	3.	Arthur Hollick, expenses as nuisance inspector,	\$18 40
	3.	G. C. Caldwell, expenses as public analyst...	20 33
	3.	Frederick Carman, for expenses	5 00
	3.	Charles E. Munsell, expenses as chemical in- specter	7 38
	3.	S. A. Lattimore, expenses as public analyst..	33 29
	3.	Emil Kuichling, expenses as sanitary engineer,	24 33
15.		Horace Andrews, expenses at Oak Orchard swamp	24 50
17.		Thomas Evershed, expenses at Oak Orchard swamp	41 64
22.		Dr. F. C. Curtis, expenses investigating epi- demic at Port Jervis.....	12 70
22.		John Kerr, for detective services at Newtown creek	226 00
22.		Edward W. Martin, expenses while investigat- ing lard cheese	\$8 00
23.		Dr. R. M. Moore, expenses as medical in- specter	6 78
Dec.	1.	Emil Kuichling, expenses as engineer.....	6 04
	3.	S. A. Lattimore, expenses as public analyst..	5 18
	4.	Arthur Hollick, expenses as nuisance inspector,	24 70
	4.	Edwin P. Clark, expenses as nuisance in- specter.....	3 95
	7.	Charles E. Munsell, expenses at Glen Gove..	7 00
20.		Dr. J. S. Cooley, expenses as medical in- specter	3 30
20.		Dr. F. C. Curtis, expenses as medical inspector,	21 23
20.		Arthur Hollick, expenses as inspector.....	12 70
1884.			
Jan.	4.	S. A. Lattimore, expenses as public analyst..	80
	4.	Dr. F. C. Curtis, expenses for inspections at Cobleskill	3 07
	4.	Richard Prescott, expenses as sanitary engi- neer.....	3 20
25.		W. G. Tucker, expenses as public analyst....	12 81
Feb.	4.	W. G. Tucker, expenses as public analyst....	1 85
26.		Dr. F. P. Foster, for 50 slips of animal vaccine,	5 00
27.		Anna L. Mattimore, for type-writing.....	9 02

1884.

Feb.	27.	Charles E. Munsell, for expenses at milk investigation, Orange county.....	\$46 90
	27.	Arthur Hollick, for expenses as inspector....	13 55
	27.	A. B. Husted, for bovine virus.....	7 50
	27.	Subscription to Sanitarian for 1884.....	4 00
Mar.	3.	S. A. Lattimore, for expenses as public analyst,	09
	5.	Charles H. Leonard, for vaccine virus.....	2 00
	7.	Arthur Hollick, for expenses as sanitary inspector	3 80
	18.	Frederick Carman, for expenses attending meeting of Board.....	22 00
April	1.	S. A. Lattimore, for expenses attending meeting of Board.....	24 32
	4.	Horace Andrews, C. E., for expenses as engineer	19 51
	5.	C. H. Zielman, for engrossing resolutions on death of Dr. Harris.....	20 00
	8.	Dr. F. C. Curtis, for expenses as sanitary inspector	11 24
	8.	Arthur Hollick, for expenses as sanitary inspector.....	4 25
	27.	I. L. Carman, for engrossing 24 sheets of death certificates	24 00
		Anna L. Mattimore, for engrossing 40 sheets of death certificates.....	40 00
June	7.	Arthur Hollick, for expenses as inspector....	4 55
	24.	Isabel L. Carman, for engrossing 8 sheets of death certificates.....	8 00
	26.	Stewart G. Spier, for type-writing.....	1 98
	26.	Anna L. Mattimore, for engrossing 80 sheets of deaths.....	80 00
July	1.	Howard Batchelder, for engrossing 56 sheets of deaths	56 00
	8.	Arthur Hollick, for expenses as sanitary inspector	6 20
	9.	Frederick Carman, for expenses attending Board meeting.....	14 05
	11.	W. G. Tucker, for expenses as public analyst,	14 57

1884.

July 16.	Horace Andrews, C. E., for expenses as sanitary engineer.....	\$24 80
24.	Dr. Eugene Beach, expenses while investigating trichinosis.....	21 60
	I. L. Carman, for engrossing 24 sheets of death certificates.....	24 00
Aug. 1.	Anna L. Mattimore, for engrossing 72 sheets of death certificates.....	72 00
6.	Frederick Carman, for expenses in attendance on drainage committee.....	29 10
6.	Stuart G. Spier, for type-writing.....	2 58
	Rodgers & Ruso, for type-writing.....	12 70
7.	Dr. Wm. Hailes, for slides for microscope...	31 00
7.	Arthur Hollick, for expenses as inspector....	30 70
12.	I. L. Carman, for engrossing 25 sheets of death certificates.....	25 00
Sept. 4.	Anna L. Mattimore, for engrossing 12 sheets of death certificates.....	12 00
	Anna L. Mattimore, for type-writing.....	25 76
	Horace Andrews, C. E., for expenses as sanitary engineer.....	14 10
	Horace Andrews, C. E., for expenses as sanitary engineer.....	15 37
	D. S. Wilson, C. E., for expenses as sanitary engineer.....	165 94
	I. L. Carman, for engrossing 32 sheets of deaths,	32 00
	Howard Batchelder, for engrossing 48 sheets of deaths.....	48 00
	Dr. F. C. Curtis, for expenses as medical investigator.....	4 93
15.	Arthur Hollick, for expenses as sanitary inspector.....	2 70
23.	Horace Andrews, C. E., for expenses as sanitary engineer.....	19 64
	Anna L. Mattimore, for type-writing.....	18 95
	Stuart G. Spier, for type-writing.....	7 50
May 3.	Anna L. Mattimore, for type-writing.....	6 63
June 13.	Stuart G. Spier, for type-writing.....	3 93
Sept. 20.	Stuart G. Spier, for type-writing materials....	1 98

1884.

Sept. 30.	Brace Gallien, for engrossing 40 sheets births,	\$40 00
	Anna L. Mattimore, for engrossing 76 sheets deaths.....	76 00

1883.

Nov. 2.	Dr. Elisha Harris, for expenses for experts on visit to Croton water shed.....	118 35
		<hr/> \$1,863 97 <hr/>

FURNITURE ACCOUNT.

1883.

Nov. 5.	Westcott, for two oak desk-stools.....	\$9 50
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1884.

Jan. 15.	Wm. M. Whitney, baskets, dusters, etc.....	4 65
Feb. 25.	Van Heusen, Charles & Co.....	28 00
May 4.	R. Hoe & Co., one letter press.....	40 75
June 9.	Wm. Wales, one microscope and appurtenances,	266 10
21.	Wm. Wales, furnishings for microscope and appurtenances.....	22 50
	J. H. McCalister, furnishings for microscope and appurtenances.....	9 34
July 10.	S. G. Spier, one type-writer.....	100 00
Aug. 9.	Farley & Hoffman, one microscope case.....	16 00
	Keuffel & Esser, one anemometer.....	22 00
		<hr/> \$518 84 <hr/>

EXPRESSAGE AND TELEGRAPHING.

1883.

Nov. 1.	American Express Co., for October.....	\$10 45
	1. National Express Co., for October.....	3 70
Dec. 1.	American Express Co., for November.....	4 85

1884.

Jan. 4.	American Express Co., for December.....	4 30
Feb. 2.	American Express Co., for January.....	6 85
	25. Western Union Tel. Co.....	2 97
March 5.	American Express Co., for February.....	6 00

1884.			
March	8.	National Express Co., for January.....	\$3 05
		National Express Co., for February.....	5 95
	31.	American Express Co., for March.....	2 05
		National Express Co., for March.....	2 20
May	1.	American Express Co., for April.....	4 20
		Western Union Tel. Co., for April.....	1 66
		National Express Co., for April.....	5 75
		American Rapid Tel. Co., for April.....	2 38
June	4.	Commercial Telephone Co., for May.....	6 00
		Western Union Tel. Co., for May.....	2 15
		National Express Co., for May.....	4 05
		American Express Co., for May.....	8 39
July	5.	Commercial Telephone Co., for June.....	5 00
		American Express Co., for June.....	7 50
		Western Union Tel. Co., for June.....	2 82
		National Express Co., for June.....	4 00
Aug.	7.	American Express Co., for July.....	9 19
		National Express Co., for July.....	12 52
		Western Union Tel. Co., for July.....	5 21
		Commercial Telephone Co., for July.....	5 00
Sept.	5.	Commercial Telephone Co., for August.....	5 10
		Western Union Tel. Co., for August.....	7 73
		American Express Co., for August.....	4 70
		National Express Co., for August.....	8 00
	30.	National Express Co., for September.....	3 20
		American Express Co., for September.....	4 05
		Western Union Tel. Co., for September....	4 57
		Commercial Telephone Co., for September...	5 25
			<hr/>
			\$180 79
			<hr/>

PRINTING AND STATIONERY.

1883.

Dec.	7.	R. K. Quayle, printing three reams note.....	\$12 00
		Ferguson Halpen, printing 9,000 envelopes...	8 00

1884.

Feb.	27.	Weed, Parsons & Co., printing per account..	583 80
Mar.	31.	Van Benthuyssen & Co., printing per account..	225 00
		Van Benthuyssen & Co., printing per account..	634 75

1884.

May 10.	Julius Bien & Co., for photo-lithography per account.....	\$31 00
12.	Julius Bien & Co., for photo-lithography per account.....	64 00
20.	Van Benthuyzen & Sons, printing.....	42 50
	Van Benthuyzen & Sons, printing.....	611 00
June 26.	Julius Bien & Co., printing	40 00
	Weed, Parsons & Co., printing.....	265 59
	Fergus Halpen, printing	13 00
July 10.	Edwin Ellis & Co., stationery.....	2 25
Aug. 6.	Julius Bien & Co., lithography.....	22 50
	D. R. Niver, filling hektograph.....	2 50
12.	Bender & Sons, for letter clips.....	5 25
Sept. 15.	R. K. Quayle, per account	54 12
23.	Fergus Halpen, for printing envelopes.....	17 90
30.	Julius Bien & Co., for lithographing.....	223 50
	Samuel Raynor, for account October, 1881...	12 30
	Argus Co., for printing.....	74 00
		<hr/> \$2, 944 96 <hr/>

LIBRARY ACCOUNT.

1883.

Dec. 31.	B. Westerman & Co., for books	\$158 58
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1884.

April 2.	B. Westerman & Co., for books.....	4 73
21.	Subscription to sanitary engineer.....	4 00
June 4.	Journal of comp. med. subscription to	10 00
6.	Albany city directory.....	3 00
6.	J. H. Vail & Co., for books	52 23
July 9.	W. F. Christern, for books.....	9 50
	D. Van Nostrand, for books.....	2 14
Sept. 23.	B. Westerman & Co., for books.....	38 70
		<hr/> \$282 88 <hr/>

UNCLASSIFIED PAYMENTS AT CENTRAL OFFICE.

1884.

Feb. 23.	Petty cash paid by Dr. Harris to Jan., 1884..	\$8 16
25.	Petty cash, John Palmer, for lettering.....	3 00
27.	Petty cash paid by Frederick Carman, chief clerk in charge.....	3 60
April 11.	Petty cash paid by Dr. A. L. Carroll.....	5 05
June 26.	Rent of P. O. box for quarter.....	3 00
	Petty cash paid by Frederick Carman, chief clerk in charge.....	1 60
	Petty cash paid by Dr. A. L. Carroll, sec'y...	5 00
		<hr/> \$29 41 <hr/>

ERASTUS BROOKS, *Chairman*,
GEORGE W. COOKE, M. D.

CENTRAL OFFICE.

A few extracts are given showing the nature of the correspondence at the Central Office.

Application having been made by the Brooklyn Health Department for the aid of the State Board in investigating cow stables beyond the city's jurisdiction, but from which the city suffered through its milk supply, Dr. McLean was commissioned to act for the State Board of Health. The following is his report:

BROOKLYN, N. Y., July 19, 1884.

ALFRED LUDLOW CARROLL, Esq.,

Secretary State Board of Health, Albany, N. Y.:

SIR — In compliance with yours of 26th ult., I have examined many of the cow stables in Flatbush, but these stables are so intercepted with others in adjacent townships that it is difficult to draw a line, and to render this inspection of public benefit it should know no such line. The energetic action of the board of health of this city against diseased milk-producing cows is driving them all beyond the city limits in various directions. This city is doing all that it can to mitigate this prolific source of disease, still the same condition exists, and I regret to say, under no supervision.

There are other diseases which should be taken cognizance of as well as contagious pleuro-pneumonia, such as tuberculosis, also the hygienic and sanitary condition of the stables, the latter conditions in many instances being deplorable, and to expose milk to the contaminated condition of many of the stables cannot fail to be a fertile source of conveying diseased germs. The above remarks refer to stables beyond the city limits. In my inspection yesterday in the Flatbush district, I found in the possession of four different owners, about 200 head of cattle, fed principally upon boiled garbage, obtained from the large hotels of this and New York city; these are kept for beef-producing purposes, and I say such meat cannot be a healthy article of diet with the same owners feeding upon the same material about 400 pigs. This within a "stone throw" of the city limits and in close proximity to the penitentiary and county buildings. If consistent I would suggest that my power of inspection be extended to the surrounding townships, and that cognizance be taken of the subjects referred to above. A detailed report of the condition of the Flatbush township will be mailed to you at an early date.

Respectfully,

L. W. McLEAN, *M. R. C. V. S.*

Measures were taken through publicity to correct the evil above referred to and the report of the inspector being called for was as follows:

BROOKLYN, August 23, 1884.

ALFRED LUDLOW CARROLL, M. D.,

Secretary State Board of Health, Albany, N. Y.:

SIR — I beg to report that I have examined the cow stables in the Flatbush district, twenty-eight in number, and containing 477 (four hundred and seventy-seven) cows, and while I found none affected with acute contagious pleuro-pneumonia, a considerable number showed symptoms of old lung lesions of said disease.

List of Cow Stables Inspected in Flatbush.

	Cows.
Patrick Oats, Kirk avenue near Brighton road	48
J. W. Wilder, Coney Island road	11
Louis Britz, Cayton avenue	13
Wm. Smith, Smith's hotel	6
Owen Cumiskey, Adam street	5
Fred Behrens, Franklin avenue	36
D. Kellmer, Franklin avenue	4
C. Hoffman, Watrous' old house	9
W. Moran, in rear of Watrous' old house	11
W. Bolan, in rear of Watrous' old house	14
T. McGibney, Church lane	36
T. Trimmer, Cedar street	7
Wm. D. Gattis, Malbone street	11
E. Sennott, East New York avenue	60
John Brady, East New York avenue	17
J. Clancy, East New York avenue	25
R. Kelley, East New York avenue	30
Thos. Turrin, East New York avenue	9
P. Murphy, Rochester avenue	20
J. Fox, Rochester avenue	22
Henry Monahan, Clarkson street	6
Wm. Crozier, William street	22
T. McKenney, Prospect street	8
Mrs. O'Connell, Baker street	5
J. Mollineaux, East Broadway	17

	Cows.
J. Morrow, East Broadway	14
P. Fitzpatrick, Canarsie road.....	6
J Holahan, Erasmus street.....	5
Twenty-eight stables.....	477

The sanitary and hygienic condition of many of the stables could be much improved. Allow me to again draw your attention to the detrimental effect that the system practiced in this district of feeding so many cattle upon boiled garbage must necessarily have upon our food and milk supply, and that some sanitary regulations should be enforced in relation to the hundreds of pigs fed under the same system.

Respectfully,
L. McLEAN.

The following notification of the existence of tuberculosis was received :

BROOKLYN, N. Y., *November 10, 1884.*

DOCTOR A. L. CARROLL, *Secretary State Board of Health, Albany, N. Y. :*

DEAR DOCTOR — The following report was made to me this morning by Meat Inspector Hobday of this department ; its importance will be apparent at a glance.

“On Wednesday last, November 5, I heard that seventeen (17) cows from the west had been sent to Foster’s Meadows, Long Island, I suspected that the cows were sick. I went to Foster’s Meadows on Friday (Nov. 7), and within a distance of three (3) miles I found three (3) of these cows that had died of tuberculosis, one of them on the farm of George Baab.

“I was unable to trace the remaining fourteen (14). The cows were said to belong to a man from the west, whose name I was unable to learn. W. J. Hobday, Inspector.”

Respectfully,

J. H. RAYMOND, M. D.,
Commissioner.

Notices to the local boards of health of the vicinity were sent off, of which the following is a copy :

STATE BOARD OF HEALTH OF NEW YORK, {
ALBANY, *November 11, 1884.* }

To the Supervisor of :

SIR—The following report, made by Meat Inspector Hobday to the health department of Brooklyn, has been transmitted to this office :

“On Wednesday last, November 5, I heard that seventeen (17) cows from the west had been sent to Foster’s Meadows, Long Island. I suspected that the cows were sick. I went to Foster’s Meadows on Friday, November 7, and within a distance of three (3) miles I found that three (3) of these cows had died of tuberculosis, one of them on the farm of George Baab.

“I was unable to trace the remaining fourteen (14). The cows were said to belong to a man from the west, whose name I was unable to learn. W. J. Hobday, Inspector.”

The importance of this matter, to both cattle-owners and the public, is evident. You are therefore requested, in accordance with section 2 of the act for the preservation of the public health, to immediately convene your town board of health and take all possible steps to trace and prevent farther movement of the diseased cattle.

EDWARD M. MOORE, M. D.,

President.

ALFRED LUDLOW CARROLL, M. D.,

Secretary and Executive Officer.

The following return was received from Newtown :

NEWTON, QUEENS COUNTY, N. Y.

Report of the committee on nuisances in the matter of sick cows sold in the county of Queens, referred to in a letter from the State Board of Health, dated November 11, 1884 :

The undersigned, your committee, respectfully reports, that in the above matter after a careful inquiry, we have ascertained the following facts :

1. On the 1st of November, 1884, a cattle-dealer whose name is Rosenberg, sold fourteen cows in Hayestown (Jamaica), some of which he sold to the farmer George Baab of Foster’s Meadows, as referred to in letter of State Board.

2. The cows referred to were brought from Kings county throughout town by way of Middle Village and of Richmond Hill to Jamaica.

3. The said Rosenberg lives with his brother-in-law, also a cattle-dealer, at 71 Graham avenue, Brooklyn.

4. Our witness for above facts is Franz Abt, from Ridgewood.

Respectfully,

EMANUEL BRANDON,
THOMAS F. McDONALD.

November 28, 1884.

To Secretary State Board of Health, Albany, N. Y. :

SIR — I send you the above copy of part proceedings held at board of health meeting November 24, 1884, per directions of the board. I remain,

Yours faithfully,

WILLIAM O'GORMAN,
Town Clerk.

The following notification of hog cholera was received :

BROOKLYN, N. Y., Dec. 15, 1884.

A. L. CARROLL, M. D., *Secretary State Board of Health :*

DEAR DOCTOR — Inclosed please find report of Dr. McLean to this department upon the subject of hog cholera in Flatbush.

Very respectfully,

R. M. WYCKOFF, M. D.,

Secretary,

Per G. I.

BROOKLYN, December 13, 1884.

Commissioner J. H. RAYMOND, *Department of Health, City :*

SIR — I beg to report that I have finished my investigation as to the alleged outbreak of hog cholera in the Flatbush district and find that its prevalence there is beyond a doubt. As requested by you I co-operated with the local authority in this investigation ; I purchased several animals affected in various stages of this disease, some of them exhibiting the characteristic physical signs ; they were kept alive for a few days and their symptoms carefully noted, when autopsies were made upon the carcasses, and the specific lesions of hog

cholera obtained in the thoracic and abdominal viscerae, the mortality from the disease in the district referred to must have been very high, and to stamp it out will require extreme and energetic measures.

The hygienic and sanitary conditions under which these piggeries are maintained are utterly defective, and their close proximity to the city constitutes a standing menace to the health of Brooklyn and a fertile field for the propagation of any epidemic disease.

Respectfully,

L. McLEAN,

Veterinary Inspector.

Thereupon the town board received the following notice :

STATE BOARD OF HEALTH OF NEW YORK, }
ALBANY, *December 16, 1884.* }

To the Supervisor of the town of Flatbush :

SIR — The subjoined communication from the health department of Brooklyn is hereby referred to your local board of health with the request that you take promptly such measures as may be necessary to abate the virulent disease in question, which endangers the public food supply as well as the interests of your own community. Hog cholera is not only very infectious among swine, but transmissible to sheep and other animals, and its contagion exists even in the dried tissues of diseased hogs, and clings long to infected pens or other premises. Cars and boats which have been used to transport infected animals may convey the malady to subsequent cargoes of swine. As the sickness is almost always fatal, diseased swine should be slaughtered and deeply buried in an isolated place, quick-lime being freely used to cover them; animals which have been exposed to infection should be isolated and kept under observation; pens destroyed or carefully disinfected; and all unsanitary conditions removed. An early report of the steps taken by your board and the results thereof is requested.

I am, sir, your obedient servant,

ALFRED L. CARROLL, M. D.,

Secretary and Executive Officer.

DIPHTHERIA IN A PUBLIC SCHOOL AT LANSINGBURGH.

On the 23d of December, 1884, the following note was received from Dr. E. W. Capron, health officer of Lansingburgh:

Secretary of the State Board of Health:

We are having here quite an epidemic of diphtheria, largely and mainly in one of our schools. The smaller children where the disease chiefly prevails have been drinking filtered cistern water, the filter made of gravel and charcoal. Will your Board analyze some of this cistern water, and, if so, will you please give directions as to sending, etc.

Yours,

E. W. CAPRON.

In response to this, I visited Lansingburgh in person, and learned from inquiry and inspection the subjoined data:

The village is situated on a flat plane bordering the Hudson river, and bounded on the eastward by a steep water-shed which must turn upon it a large amount of rainfall during wet seasons. The surface formation is coarse gravel, underlaid at varying but not great depth by slaty shales, which, at the river bank, have a landward dip impeding the outflow of the subsoil water, the natural drainage valleys running, with very slight descent, almost parallel to the river. The disposal of the sewage and house-refuse of the dense population has for many years been by means of leaching privy-pits and cess-pools, with which the village in some neighborhoods is almost honeycombed. A system of main sewerage is now in course of construction, vitrified pipes being laid in some of the thoroughfares, and brick sewers, as I was informed, being projected for others.

The water supply has been derived partly from rain-water cisterns, but chiefly from surface wells about twenty feet in depth, the water level being said to be subject to considerable fluctuations. During the summer, however, arrangements were made for the introduction of a public water service from the adjoining upland, and the streets were extensively upturned in laying the mains. The disturbance of the filth-contaminated soil was followed, as I was informed, by an apparent generalized liability to tonsillitis, but, as far as I could learn, the first recognized case of diphtheria occurred soon after the re-opening of the public school in Market street at the end of the summer holidays. A child, in whose family no previous zymotic

illness had existed, entered the school on the opening day, and after three days' attendance, sickened with what proved to be septic diphtheria. No exposure to any prior source of infection could be traced. This case was followed, at short intervals, by fifty-two others, the majority of which occurred among the smaller children in the class-rooms on the lower floor of the school-house.

The main building of the school is nearly forty years old, erected upon the gravelly soil without a cellar. Some years ago a wing was constructed on the northern end, under which a cellar was excavated, comprising the site of two privy-pits which had been used by many successive generations of pupils. This cellar and the foundation walls are uncemented and the loose texture of the soil permits free passage of the ground-air and of organic exhalations. The school-rooms are heated by air-tight stoves, the only provision for ventilation being by means of unwarmed eight-inch shafts leading to the roof. There is thus every probability of an indraught of the soil atmosphere through crevices in the flooring and other chance inlets. The average number of pupils, I was told, is 400, the cubic space in the lower class-rooms ranging from about 200 cubic feet *per capita*, with ordinary attendance, to less than 150 cubic feet if all the seats were occupied. At the time of my visit the school was closed for the Christmas holidays, so that I was unable to obtain accurate data in this respect.

On the eastern and western sides of the school, respectively, and about twenty feet from the walls of the building, are two large privy-pits, dug into the porous soil, both of which at the date of my inspection were very mal-odorous, although they were said to have been partially emptied and cleansed before the re-opening of the school, and despite the fact that the temperature was far below the freezing point. The rocky substratum here has a declining slope from east to west; the eastern privy-pit being sunk to the rock, the slant of which tends directly under the adjacent school-house. With this impervious floor, it is evident that the foul liquids from the privy must drift beneath the school, and it is reasonable to suppose that any emanations therefrom would show their most marked effects in the lower class rooms. I took for examination some of the gravelly soil from the cellar, and after agitating a little of this with distilled water, found the infusion swarming with bacterium termo and containing multitudes of micrococci.

The cistern to which reference was made in Dr. Capron's note is

situated on the western side of the school, the water from the roof passing through a filter. It is apparently tight ; its coping raised above the ground to avert surface washing ; and the water is free from odor or turbidity. The addition of nitrate of silver gave no reaction of chlorine. The overflow pipe discharges, I was told, into the surrounding gravel, which, in view of the neighboring sources of soil pollution, cannot be regarded as a desirable destination. It is to be presumed, however, that the completion of the public water supply system will abolish the use of any other source.

Taking all the circumstances into consideration, I believe that the principal factor in determining the incidence and propagation of disease in the Market street school has been excremental pollution of the soil and ground atmosphere around and beneath the building ; a general predisposing influence having probably been exerted by the extended upturning of the earth in trenching for water mains and sewers.

I should advise that the cellar and the earth under the main building be dug out to the depth of at least a foot, and covered with a thick layer of concrete, the foundation walls being cemented — or still better, asphalted — to a point above the ground-level. All rotted floor-timbers or boards should be replaced by sound ones, and the whole interior of the building should undergo a thorough purification, after fumigation with sulphur. The use of the leaching privies should be abandoned ; the pits emptied and the soil for two or three feet around them removed ; they should then be filled with clean earth, freely admixed, at the bottom, with chloride of lime and finely broken copperas. For the disposal of excreta, since a sewerage system is now available, I should recommend water carriage by means of trough-lattines. If these were placed in a well-constructed “lean-to” building, warmed by a stove, there would probably be small risk of freezing ; but as an additional precaution, if the grade to the main sewer permit, the floor of the outbuilding might be sunk below the ground level and concreted, and the flushing tank for the latrine could be placed within the main building. The expense of such suggested alterations should not stand in the way where the health of hundreds of children is concerned, and nothing less would suffice, in my opinion, to render the school safe.

It is also desirable, and would not be very costly, that the arrangements for warming and ventilation be improved so as to effect a freer movement of the air. There are several simple patterns of ventilating stoves whereby pure warmed air can be introduced into

a building ; and, even with ordinary stoves, it is possible to provide reasonable renewal of the atmosphere by various plans which are described in Dr. D. S. Lincoln's report on school hygiene, in the Second Annual Report of the State Board of Health. Even with better ventilation than now exists, I would suggest that, at the least, 250 cubic feet be allowed for each inmate. With sufficient space, pure air, pure water, and safe and speedy removal of excreta, the conditions of health are satisfied ; without these zymotic disease is invited and intensified.

It is almost superfluous to add that while the necessary alterations are in progress, and until they are completed, the school should be vacated.

ALFRED LUDLOW CARROLL, M. D.,
Secretary and Executive Officer.

A nuisance, reported at East Albany, led to the following action :

ALBANY, *December 31, 1884.*

To the Board of Health of East Albany :

GENTLEMEN — I beg to refer to you the accompanying complaint, just received at this office, from Messrs. Whitehouse & Stewart, concerning matters which, if they be as represented, should receive your prompt attention ; and to call to your notice that the law makes it the duty of local boards of health "to receive and examine into the nature of complaints made by any of the inhabitants," and to make such orders as may be necessary for the suppression and removal of nuisances. I am,

Your obedient servant,

ALFRED LUDLOW CARROLL, M. D.,
Secretary and Executive Officer.

16 FIRST STREET, EAST ALBANY, N. Y., *December 29, 1884.*

To the Honorable State Board of Health :

GENTLEMEN — Whereas Mr. Michael Doran has built a box on the sidewalk in front of his stable near to my property, said box being used as a receptacle for the manure from said stable, and which is a great nuisance to my family and the public who have occasion to pass that way, and which is also, I think, contrary to law ; and whereas said stable is built nearer to my well of water than is allowed by the village charter, and may by drainage spoil the well water ; and whereas the privy built on the rear of Mr. Andrew Hines' lot, adjoining my property, emits very bad odors and is a great nuisance to my family and tenants, I have duly notified our local board of health, and have also petitioned the village

trustees in regard to said nuisances, and no action has been taken for the removal of said nuisances. I, therefore, ask your honorable body to take immediate action for the inspection and removal of the said nuisances by giving this your earliest attention, and you will confer a great favor on your humble petitioner.

THOMAS WHITEHOUSE,
16 First street, E. A.
FRED. L. STEWART,
Tenant.

The Bureau of Labor Statistics having requested information concerning the effects of factory life upon children, the following response was made :

STATE BOARD OF HEALTH OF NEW YORK, }
ALBANY, *November 30, 1884.* }

DEAR SIR — In response to your request for such information as I could give you concerning the effects of employing children in manufacturing or other occupations, I have to say that, in my opinion, the subject is too complex and involves too many varying factors to allow the formulation of definite general rules.

For the maintenance of health, in children even more than in adults, nature demands a sufficient supply of nutritious food and of pure air ; the avoidance of extremes of temperature ; exercise of the muscular system within the limits of fatigue ; and reasonable time for recreation. That these conditions are often violated in places where children are employed for hire is undoubtedly true ; but so they are in many schools, and in the homes of the poorer classes where overcrowding and improper nourishment fall to the lot of all ages, and children's strength is overtaxed with household drudgery. The physical welfare of such children would probably be promoted by transfer to some light and well-conducted employment wherein with limited hours of labor they could aid in procuring more domiciliary comforts.

The character of the occupation is, therefore, the first thing to be considered. Some mechanical pursuits are essentially dangerous to health ; as in factories where the air is laden with irritating particles of dust, whether of mineral or vegetable origin ; or where poisonous matters, such as arsenic, lead or mercury, are used for coloring or other purposes. Others involve, on the one hand, peril to the circulatory system by muscular overstrain, or on the other hand, entail

sedentary habits and cramped positions, in a close atmosphere. The first of these classes of pursuits should, in my judgment, be absolutely forbidden for children, and employers should be obliged to adopt every known precaution to lessen the danger for adult workers therein. The latter class of occupations might be rendered comparatively safe by apportioning the character and duration of labor to the age and capacity of the employed, and requiring sufficient cubic space and ventilation. But in this connection arises a question depending upon individual peculiarities of two boys at the age of fifteen; one may be naturally so delicate as to be incapable of supporting the slightest fatigue, whilst the other is vigorous enough to perform almost a man's labor without injury. In the other sex, especially during the period from commencing puberty to mature womanhood, similar personal differences exist, and some robust girls will undergo, without apparent injury, either active toil or wearisome confinement to which their frailer sisters soon succumb.

If it were practicable I should advise that a medical examination of physical condition and constitutional or hereditary tendencies be made a prerequisite for the employment of children in any trade or manufacture, and that subsequent medical inspections be made at stated intervals to ascertain if in any case detriment to health were caused by the occupation. As regards the minimum average requirements for women and children of different ages, in respect of hours of labor, etc., I should approve those of the British Factories Acts, for a synopsis of which, and for much other valuable information on the subject, I beg to refer you to an excellent essay by Dr. Roger S. Tracy, on the hygiene of occupations, published in Buck's Hygiene, Vol. II, New York, 1879.

I am, sir, faithfully yours,

ALFRED LUDLOW CARROLL, M. D.

CHOLERA.

The threatening aspect assumed by cholera in the south of Europe, and the possible danger of its importation into this country induced the Board to issue the following circular of warning and advice:

WARNING AGAINST CHOLERA.

ALBANY, *November 13, 1884.*

Local health officers and boards of health are hereby apprised that the rapid advance of cholera in Europe threatens an invasion of this

country, which may occur at any moment, and are notified that the State Board of Health expects their strict performance of the duties imposed upon them by law. Among these duties are: the determination of the period of quarantine of vessels, vehicles, or persons, arriving from an infected locality; the regulation of intercourse with infected places; the suppression and removal of nuisances; the examination of places where conditions dangerous to public health are known or believed to exist; to report promptly to the State Board of Health facts relating to epidemic disease, and to require such isolation and quarantining of persons, vessels, and sources of infection as shall be necessary; in brief, to use all possible means to avert the introduction, or prevent the spread, of an epidemic as disastrous as cholera has everywhere proven itself to be.

These duties are not discretionary with local boards of health. The law is mandatory, and no evasion or neglect should be tolerated in face of the danger which menaces the community.

Experience has shown that the cholera poison does not extend where no filth favors its multiplication; and that the only way to arrest its march is to remove all sources of pollution of soil or water. In excremental contamination especially lies the greatest risk. All such conditions must be at once removed.

ALFRED LUDLOW CARROLL, M. D.,
Secretary and Executive Officer.

MEMORANDUM CONCERNING CHOLERA.

Asiatic cholera is again on its deadly march. The Atlantic ocean and the organized resources of sanitary knowledge and authority in our country, and in European ports constantly in communication at once with our shores and the infected regions of the Mediterranean, are barriers trusted thus far for defense. The possibility and facilities for the introduction of this disease upon this continent are too obvious to be disregarded. The history of former invasions by cholera seems to warrant the opinion that its reappearance here is probable. It is a public duty to be prepared for it.

Though the home or original source of cholera is supposed to be in India, Egypt has long been a prolific hot-bed out of which its infectious virus has rapidly progressed as an epidemic across Europe and the Atlantic, to our American ports. Cholera, which in the two months of midsummer in 1865 destroyed upwards of 80,000 lives

in lower Egypt, reached France and Germany before the end of September, and was discovered on immigrant ships at the New York quarantine anchorage early in November; although all discoverable cases were restrained at quarantine, yet in the spring of 1866 this disease was again threatening the United States. It had stealthily evaded all quarantines and was spreading from several points at once in the city of New York.

Successfully controlled, and, as we hoped, suppressed upon the Atlantic coast where all the resources of sanitary knowledge were brought to bear, it lingered in the west, was returned to the military rendezvous at Governor's Island, and thence found a new line of departure to military posts, south and west, and during the year 1867 was terribly destructive in the south and south-west. The outbreak and rapid march of cholera in the valley of the Mississippi in 1873 was traced to an unsuspected introduction by way of New Orleans, and it is believed to have been arrested by the timely and universal operation of sanitary measures.

Is cholera coming? — The warning. — The disease, as reported in southern Europe, presents the same threatening aspects that it did in August, 1865. It was then conveyed to our shores in a definite manner and to about the same series of resting places and fatal points of outbreak that it now threatens to attack. The facilities for the unsuspected and very speedy movements of this pest from the Mediterranean shores to the American are greater now than they were in 1865. The means of exact sanitary knowledge and quarantine police for arresting and stamping out the transportable cause of it are also greater. It is safe to conclude that the resources of sanitary resistance have so greatly increased that the certainty of success in the public duty of preparation and prevention will now warrant the assurance that no city, village or town that is found prepared and ready for the announcement that "Asiatic Cholera has come," will be invaded by it, if every case that occurs in, or is brought to the place receives adequate sanitary care. Such considerations both justify and demand the publication of this memorandum on preventive measures against cholera.

The warning — "Be ready" — is now given. The experience in all past visitations of cholera, the destructive malignancy of the disease now reported, the excessive floods throughout Europe and the greater portion of the United States the past six months, and the attendant circumstances of the drying period which are known to favor the epidemic propagation of cholera when introduced,

together with the greatly increased migration from the Mediterranean States to the port of New York, will not fail to help spread the infectious cause of the disease, unless the preparations for resisting and extinguishing it are thorough and universal.

Where the danger is and in what it consists.— It is now conceded that there is a special infective cause of Asiatic cholera, called its *contagium*, by which it spreads as rapidly as the persons suffering ever so lightly from it may go from port to port and place to place; and it has proved true in every country that this *contagium* ceases to be repropagated beyond the sanitary lines which separate the cleansed, drained, and ventilated premises, and well-conditioned inhabitants, from those that are filthy, undrained, badly sewered, crowded and unventilated, or where polluted water or crude food and harmful beverages prepare the bowels for the fatal operation of the cholera poison, and as even the light and painless diarrhoea of cholera may infect the earth and the waters wherever the travelers from cholera districts go, the modern facilities of travel and transportation now tend to spread cholera over all the continents, in a single year, as readily as it was conveyed in the fifteen years of slower marching in its first great invasion.

It has been correctly remarked that for cholera to be diffused from continent to continent over the earth, it must have three factors for its cultivation:

“1. A center of pollution for its *cradle*.

“2. A ship for its *transport*.

“3. A number of towns *prepared for its reception and development*.”

The fact that the matters which a cholera patient discharges from the stomach and bowels *are infective*, and that when decomposing or for a short time remaining in wet or foul places or in water used for drinking, becomes a prolific source of propagation of the disease, is abundantly demonstrated, and has given us the key to the special sanitary duties by which the epidemic progress of cholera is prevented in great cities, while entire continents may be protected against its ravages. The great sources, centers and lines of danger are conspicuous in Egypt and all the Mediterranean countries, and they exist in all the European cities whence immigrants depart for New York and other American ports. The local conditions of danger, namely, the sanitary neglects that have prepared for a lodgment and repropagation of the cholera in filthy places and sodden grounds, are found in every port, city, village and manufacturing town,

and in many a rural neighborhood and hamlet. The spread of cholera is almost inevitable in the Mediterranean countries when once on the march, and it is very difficult to prevent its rapid propagation after it has planted a foothold in any of our commercial centers, so numerous and so interlinked are the ready prepared places for reproducing and making epidemic the exotic infection that may arrive as stealthily as a thief at night.

The presence of excremental filth, uncleansed dwellings, stagnant pools, polluted water, and of great numbers of badly-housed and imprudent people in hundreds of places in this State, will invite cholera whenever it appears in any city on our Atlantic seaboard. These common sources of harm to health that exist in numerous communities will endanger the cities and villages of the entire country, as well as the particular places that will be first to suffer.

The exclusion of cholera from the ports of our country, and the instant arrest and suppression of it as a malady which has subtle ways of spreading, is the first duty that the sanitary authorities in this State have provided for ; and now, before the exotic infection has come, let all local boards of health and all householders lose no time in enforcing such thorough scavenging and cleansing, such cleaning of sewers, drains and ditches, and such ventilating, drying, lime-washing and disinfecting of cellars and all damp and unclean places, that, if cholera comes, its infective germs shall find no soil or foul surface in which to propagate epidemically.

The nature and laws of the infection.—Not a contagion chiefly to be taken directly from the bodies of the sick, the strange and peculiar virus of Asiatic cholera is proved to require the concurrence of attendant conditions of moisture and filth to produce a group or any extended series of cases. Happily for mankind, remarks a masterly authority in hygiene, “cholera is so little contagious, in the sense in which small-pox and typhus are called contagious, that if proper precautions are taken where it is present there is scarcely any risk that the disease will spread to those who nurse or otherwise closely attend upon the sick.”

The real sources of danger are properly estimated as factors, one of which is, the exotic germinal matter which becomes not only infective of persons exposed to it by water or the atmosphere, may by its infinite rapidity of reproduction under favoring conditions of foul air and filth, rapidly become epidemic within the limits of such impurity, so rapidly, indeed, as to spread as by explosion ; and for these reasons the sanitary *barriers* must be erected by a universal

purification before cholera comes, though the infective matter itself should everywhere, as soon as found, be treated by rigorous isolation and destructive disinfection.

The ways of cholera are known, and there are sanitary resources at hand for *stamping out* its infective virus, and for controlling the foul factors without the presence of which the pest would quickly disappear wherever its poison chances to be planted, the precise nature of the *contagium* or poison may long elude the exact descriptions which *visible* things receive; but the fact that it will not re-propagate itself epidemically except where the controllable local circumstances or *foul factors* co-operate, is conclusively established. *Preventive sanitary measures consist in annihilating all such local conditions or factors.* The choleraic infection will not injure a population in any alarming degree except in the presence of a filthy condition of premises, the air, or drinking water, one, or all combined. This practical conclusion, derived from the world's experience of cholera epidemics and from sanitary science, is what all people must understand and put in practice for their own safety. The hidden secret of the destructive poison of this plague of all nations, when fully explained, may be, as is now probable, a special kind of exotic fungi that is almost harmless and dormant, even in its Asiatic home as well when conveyed across the Mediterranean countries and Europe, to America, except it meets the local conditions or *filth-factors* which supply requisite media and means for its propagation. It is certain that in the midst of such conditions the natural history of the cholera contagium seems identical with the measureless generation of such invisible organisms, and that the tragical destructiveness of cholera and the stealthiness of its spread may thus become explicable, because these ascertained and preventable defilements and special conditions of places, grounds and water-supplies, offer the means for infinite rapidity of the propagation of the poisonous germs which invade the human system to destroy it with terrible rapidity. Whether this is at last proved to be precisely the scientific fact or not, let the cholera-germs find no breeding place in the cities and villages of New York, nor in or near any dwelling place in the country. Do this before cholera comes, for it stalks across the continents as the world's great sanitary inspector and nuisance-searcher as well as the relentless destroyer, silently invading and tragically smiting the places and people that have left open the door for such visitation.

Whenever cholera comes, as we hope it will not, a brief statement

showing *how to resist cholera, and what to do in its presence*, will be immediately sent to all parts of the State through the local boards of health. It is now the duty of local sanitary authorities and all householders to inspect the premises within their jurisdiction, and promptly cause the necessary sanitary improvements to be made. None of this work will be lost, even were cholera effectually arrested by the barriers of quarantine and disinfection at the ports it enters.

The State Board of Health presents this view of general sanitary duties as being more useful to the people and helpful to the local authorities than any descriptive account of the disease and the way to deal with it in detail. The reason for sanitary inspection and works are applicable to protect against infectious and epidemic diseases generally; and it is because in the midst of wet grounds and pools, filth-sodden surfaces, foul sinks and polluted drinking waters, cholera finds local conditions for its epidemics, that now the general duty is urged upon all sanitary authorities and householders,—

To make careful sanitary inspections;

To drain all stagnant pools and low grounds near dwellings;

To clean all sewers and house drains;

To cleanse and disinfect cellars, privies and all filthy places; and

Examine and protect the purity of drinking water.

BULLETIN OF MORTALITY.

The registration in the Bureau of Vital Statistics having progressed sufficiently to warrant the publication of a monthly bulletin of mortality, the following notices were issued to all the health officers in the State:

OFFICE OF THE STATE BOARD OF HEALTH,
ALBANY, May 15, 1884. }

DEAR DOCTOR—The State Board of Health is about to commence issuing a “Monthly Bulletin” showing the mortality of the State. Your aid in this work is requested. Will you kindly fill out each month one of the inclosed postal cards, with the number of deaths occurring in your town or village, grouping them according to the printed names? The postals should be filled out and returned to this office before the 15th of each month, and should contain only the deaths of the previous calendar month.

We send you a copy of the New Nomenclature of Diseases, which we hope will be of use to you and in the office of your local board.

ALFRED L. CARROLL, *Secretary.*

To the Health Officer.

STATE BOARD OF HEALTH OF NEW YORK,
ALBANY, March 25, 1884.

To the Local Register of

DEAR SIR — In order to enable a monthly statement of mortality to be issued from the central bureau, you will please observe the rule already established, and send, on or before the 15th of each month, the certificates of the previous month only ; for example: on or before the 15th of May you should send all the certificates for the month of April. ALFRED L. CARROLL, M. D.,
Superintendent Vital Statistics.

The monthly returns made on the following copy have been growing in completeness, as will be seen elsewhere.

Local Health Officers or Registrars will please make this return at the earliest possible date.

REPORT OF DEATHS IN.....
for the month of..... 188 ..

CAUSES OF DEATH.	No. of deaths.	Population.	Remarks.
Cerebro Spinal Fever.....			
Typhus Fever			
Typhoid Fever... ..			
Malarial Diseases.....			
Small Pox			
Scarlet Fever.....			
Measles			
Erysipelas			
Whooping Cough.....			
Croup and Diphtheria			
Acute Respiratory Diseases			
Consumption			
Puerperal Diseases			
Diarrhoeal Diseases.....			
Diseases of Digestive System			
(Not Diarrhoeal.)			
Diseases of Urinary System.....			
Diseases of Circulatory System..			
Diseases of Nervous System.....			
Cancer			
Accidents and Violence			
Old Age.....			
Unclassified			
Deaths from all causes....Deaths under 5 years...			

Please note any mortality from unusual causes, not specified in this blank. Please report cases of Small Pox and the prevalence to a great extent of any disease, especially Typhoid Fever, Diphtheria and Scarlet Fever.]

Signature

SANITARY COMMITTEE.

REPORT

ON THE PROPOSED USE OF AN ABANDONED BURIAL GROUND FOR THE ERECTION OF A SCHOOL-HOUSE, AT PORT JERVIS.

An act of Legislature was passed March 25, 1884, empowering the board of education to acquire the title to St. John's burying ground, in the village of Port Jervis, for the enlargement of a school-house site adjacent thereto. As it was proposed under this act to build a new school-house wholly upon the burial ground in question, some opposition was encountered among the residents and the matter was brought to the attention of the local board of health, leading to a correspondence between the latter body and the State Board of Health, the result of which was a joint request from the boards of health and education that the State Board advise as to the safety of carrying out the projected plan. In compliance with this request, on June 3d, Dr. Alfred L. Carroll, executive officer of this Board, visited Port Jervis and ascertained the following facts:

The "Old Church-yard" burial ground, immediately adjoining the southern boundary of the land under consideration, was set apart for interment early in the century, but was practically abandoned, as being fully occupied, about thirty years ago, at which time the plot since known as St. John's cemetery was annexed. This annexed ground, according to the statement of Francis S. Marvin, Esq., president of the local board of health, "is thought to contain from one hundred to one hundred and twenty-five bodies, distributed over four village lots of fifty by one hundred feet." It is added, however, that the majority of the interments were made more than fifteen years ago, the number gradually diminishing until "it is believed that not more than two, three, or four per annum have been deposited therein for the past five or six years."

The soil presents a thin superficial layer of sandy loam underlaid by a bed of fine sand fifty or sixty feet in depth. The level of the ground water is low; the wells in the vicinity of the burying ground being about thirty feet deep and subject to very little fluctuation. The direction of the flow of surface and sub-soil water is toward a valley to the southward, and consequently away from the neighboring houses and the existing school, which have thus been preserved from any manifest evil results of water or air pollution; the neighborhood generally being reported free from zymotic disease. Of the causes of death preceding interment in St. John's cemetery, little definite information could be obtained beyond the fact that some typhoid fever patients are known to have been buried there a number of years ago.

It will thus be seen that the soil of this cemetery is that best calculated to insure the rapid decomposition of human remains, and in fact Dr. Carroll was informed that the body of a child disinterred less than six years after burial was almost entirely destroyed, but few of the bones remaining. The porosity of the soil and the free circulation of air therein hasten the resolution of animal matter into its elements. But this very character of soil allows the freest passage of the gases of decomposition through its interstices.

The luxuriant growth of vegetation on the site of St. John's cemetery shows that there still remains a large amount of organic matter in the soil. Some earth taken at a depth of about one foot from the surface and subsequently moistened with distilled water, was found to be swarming with sphero-bacteria and bacterium termo, the invariable concomitants of putrefactive processes.

The products of decomposition contain a large amount of nitrogenous substances, which are ultimately taken up by vegetation. Micro-organisms, however, are very numerously developed in porous soils where air is abundant. The complete decay of bodies varies in different soils, from five or six years to even twenty-five or thirty years. In clayey, tenacious soils, the longer period is frequently reached. In the most favorable soils, little except the bones is left after twelve years. But where interments have been crowded, the ground becomes saturated with putrescent matter which cannot be fully oxidized for many years, even after the apparent destruction of the corpse. The effects of emanations from burying grounds, in small quantities, are general depression of vitality, and greater susceptibility to other causes of disease; if long continued, enteric fever

may arise, or a typhoid type be impressed upon other fevers. The greatest danger in these respects has been noticed in exhumations from old cemeteries. Instances of this abound throughout sanitary literature. Prof. Selmi, of Mantua, found in the calm air over a cemetery, organisms which, injected under the skin of a pigeon, produced a typhoid ailment causing death within three days. Near the cemeteries of Paris, a report of the French Academy of Medicine describes a prevalence of malignant throat disease raging with most violence in those quarters closest to the burial grounds. Dr. Edwin Chadwick, in 1843, stated that "inasmuch as there appear to be no cases in which the emanations from human remains in an advanced stage of decomposition are not of a deleterious nature, so there is no case in which the liability to danger should be incurred either by interment or by entombment in vaults, which is the most dangerous, amidst the dwellings of the living, it being established as a general conclusion, in respect to the physical circumstances of interment, from which no adequate grounds of exception have been established, that all interments in towns, where bodies decompose, contribute to the mass of atmospheric impurity which is injurious to the public health."

In the Sixth Annual Report of the Massachusetts Board of Health Dr. Adams reports an extended inquiry into the effects upon the public health of burial grounds. As the result of a large accumulation of statistics, the recommendation is "that every cemetery shall be discontinued for burial purposes before it becomes unduly crowded and shall never be built upon." And, again, that cemeteries which had originally been in the country but at last become surrounded by population, "should remain as parks, contributing, by their presence, to the health and beauty of the city."

According to Mr. Marvin's statement, the interments in St. John's cemetery have been at the rate of two hundred to two hundred and fifty per acre. The space prescribed by the English law is four square yards for a grave, which would give a maximum of 12 hundred and ten per acre; in some Continental countries an even greater grave-space is prescribed. And, with this space, the British law forbids the reopening of an unwall'd grave within fourteen years after the burial of a person above twelve years of age; in Prussia, a grave must not be disturbed within thirty years; in Frankfort, twenty years, and in Leipsic, fifteen years are the limits.

There can be no question that the best use of abandoned graveyards is as parks or recreation places, with rapidly growing trees

and grass to take up organic matters. In the present instance, although positive danger to life cannot be predicated, it is regarded as incurring a great risk to build a school-house upon the site of St. John's cemetery, where children at the most susceptible age would be inevitably more or less crowded together, and where they would be exposed to indraught of the ground atmosphere charged with the products of putrefaction.

A new school-house is undoubtedly needed in the district in question. The existing one affords neither sufficient cubic space nor proper light and ventilation. A number of cases of progressive near-sightedness were noticed on the occasion of Dr. Carroll's visit. Especially in the southern school-room, the windows are darkened by the foliage and the adjoining church. If possible, it is desirable that a more eligible situation be selected for the new school building than the proposed site.

In another school, on Church street, several cases of diphtheria have occurred. Immediately adjoining this school runs a water-course, referred to in Dr. Curtis' report, which receives much sewage in its course, and which, at the time of Dr. Carroll's visit, was exceedingly offensive, flowing sluggishly and with its bed filled by decomposing organic matter. It is almost certain that the condition of this stream is a standing menace to the health of the neighborhood through which it flows.

WOOLSEY JOHNSON, M. D.,
ALFRED MERCER, M. D.,
EDWARD M. MOORE, M. D., *President*,
ALFRED LUDLOW CARROLL, M. D., *Sec'y*,
Sanitary Committee.

SANITARY LAWS.

In this chapter will be found decisions of the Attorney-General on questions submitted to him by the Board. The important act for the protection of water supplies imposing special duties on the Board is also given as well as a valuable summary of English statutes for the drainage of lands.

AN ACT TO CONFER UPON THE STATE BOARD OF HEALTH POWER TO PROTECT FROM CONTAMINATION, BY SUTTABLE REGULATIONS, THE WATER-SUPPLIES OF THE STATE AND THEIR SOURCES.

The People of the State of New York, represented in Senate and Assembly, do enact as follows :

SECTION 1. The State Board of Health is hereby authorized and empowered to make rules and regulations for protecting from contamination any and all public supplies of potable waters and their sources, within this State ; provided, however, that any such rule or regulation shall not be operative in any county until the county judge of that county shall have approved the same.

§ 2. The said State Board of Health shall also have power, and it shall be its duty :

1. To publish once a week for at least six consecutive weeks all such rules and regulations as it shall have made concerning the contamination of any subsoil waters, springs, streams, lakes, ponds, reservoirs, or other bodies of water contributing to the potable water-supply of any municipality within this State, such publication to be made in one or more newspapers published in the county in which the waters affected by such regulations are located. The cost of publishing the regulations of the State Board of Health, as above provided, shall be paid by the corporation or municipality benefited by the protection of the water supply concerning which the rules are made.

2. To impose penalties for the violation of, or the non-compliance with their rules and regulations, not exceeding two hundred dollars in any one case.

§ 3. The officer or board having by law the management and control of the potable water-supply of any municipality, in all cases where the said municipality derives its water-supply in whole or in part from any subsoil waters, springs, streams, lakes, ponds, reservoirs, or other waters concerning which the State Board of Health shall make any rule or regulation, is hereby authorized and empowered to make such inspection of the sources of said water-supply as said officer or board may deem advisable, to secure the said water-supply from any defilement, and to ascertain whether or not the rules and regulations made by the State Board of Health are complied with.

§ 4. In case such inspection shall disclose the violation by any person or persons of any of the rules or regulations of the said State Board of Health relating to the sources of said water-supply, the officer or board mentioned in section 3 of this act shall serve or cause to be served a copy of the said rules and regulations, accompanied by a notice specifying the rule or regulation claimed to have been violated, upon the said person or persons violating such rules or regulations. If the person or persons so served do not immediately comply with the said regulations, the said officer or board having charge of the water-supply of the municipality affected thereby shall notify the State Board of Health of the violation of its rules; the State Board of Health shall thereupon examine into the said violation, and if the party complained of is found to have actually violated any of the said regulations, the secretary of the State Board of Health shall notify the local board of health having jurisdiction thereof to convene and enforce obedience to the said regulation.

§ 5. In case any local board of health having jurisdiction thereof fails to enforce the order of the secretary of the State Board of Health within ten days after the receipt of a notification so to do, as provided in the last section, the corporation furnishing the water-supply, or the municipality deriving its water-supply from the waters for the sanitary protection of which such rules have been made, is hereby authorized and empowered to maintain an action in a court of records and which shall be tried in the county in which the cause of action arose, against the person or persons violating the said rules, for recovery of the penalty therein provided.

§ 6. Every person who shall willfully violate or refuse to obey any rule or regulation made and published by the State Board of

Health and approved pursuant to the provisions of this act, shall be guilty of a misdemeanor, and on a conviction thereof shall be subject to a fine or imprisonment, or both, at the discretion of the court, such fine not to exceed three hundred dollars, nor such imprisonment six months. But the recovery of a penalty in a civil action, as provided in section five of this act, and criminal prosecution and conviction under the provisions of this section, shall not be had for the same offense.

§ 7. When the State Board of Health shall, for the protection of a water-supply from contamination, make regulations, the execution of which will require the providing of some public means of removal or purification of sewage, the municipality or corporation owning the water-works shall, at its own expense, construct and maintain such works or means for sewage disposal, as shall be approved by the State Board of Health.

§ 8. The State Board of Health, any local board of health, or any municipality or corporation furnishing water may cause the affidavit of the printer, publisher, or proprietor of any newspaper publishing the rules and regulations as provided by the second section of this act to be filed with such rules as published in the clerk's office of the county in which the municipality or corporation furnishing the water-supply in any case may be situated or located, and such affidavit and rules, or duly certified copies thereof, shall be deemed conclusive evidence of due publication and of all the facts therein stated in all courts and in all proceedings or prosecutions under the provisions of this act.

§ 9. All acts or parts of acts inconsistent with the provisions of this act are hereby repealed.

§ 10. This act shall take effect immediately.

REFERENCES TO MODERN ENGLISH STATUTES RELATING TO THE DRAINAGE OF LANDS, WITH A VIEW TO THE PROMOTION AND EFFECTIVENESS OF AGRICULTURAL LABOR, THE PREVENTION OF DISEASE, AND THE IMPROVEMENT OF THE HEALTH OF THE COMMUNITY.

The preamble of 9 and 10 Vict., chap. 101 (Drainage Loans Act) recites that — “whereas the productiveness and value of much of the land in Great Britain and Ireland are capable of being greatly increased by drainage, and the extension and operation of drainage is calcu-

lated to promote the employment and effectiveness of agricultural labor, and tends also to *prevent disease and to improve the general health of the community*," etc., * * * The act then proceeds to enact that it shall be lawful for the treasury of the United Kingdom, upon the application of the inclosure commissioners of England and Wales, who shall be the commissioners for the execution of this act in Great Britain, to issue and advance for loans under this act out of the growing produce of the consolidated fund of the United Kingdom such sum or sums as may be required for such loan, not exceeding in the aggregate two million pounds sterling for Great Britain and one million for Ireland.

By section 14, "any owner of land may make application for a loan to be applied in works of drainage. The commissioners may require security by bond or otherwise toward defraying the expenses of investigating such application.

And by section 34, land certified as subject to the re-payment of the advance shall be charged with the payment of a rent charge of £6 10 per cent, to be payable for twenty-two years after the issue of said advance. Provisions are made to meet the positions of tenants in tail and tenants for life who are required as between them and the persons in reversion and remainder to pay the half-yearly payments of such rent-charge, etc.

By 27 and 28 Vict., chap. 114, the powers of the inclosure commissioners under 9 and 10 Vict., chap. 101, just quoted, for England and Wales shall extend and be applicable to proceedings and inquiries under 27 and 28 Vict., chap. 114, for the further improvement of land in the United Kingdom. By this act "the improvement" of land is more specifically defined, and a joint application by several land-owners may be entertained. In cases of dissent, or when infant children are to be protected in their interests, the Court of Chancery may authorize commissioners to proceed. Other contingencies are provided for, and adjoining lands or easements may be sold to the improving land-owners for the execution of the improvements, and works necessary to be made on adjoining lands may be made under the provisions of 10 and 11 Vict., chap. 38, but no entry to be made on such adjoining lands until compensation has been ascertained and paid. And further, where, by neglect or want of co-operation among the occupiers to maintain the banks and cleanse and scour the channels of existing drains, streams or water-courses form-

ing the boundaries of the lands, and being or leading to the outfall from such lands and from other lands, injury is caused, the proprietor or occupier of such land so injured may execute the necessary works, under proper notice to the neglecting owner, and recover the expenses.

By 24 and 25 Vict., chap. 133, §§ 72-78, 82, 83, justices of the peace may decide whether an application to an adjoining owner for leave to make or improve drains through his lands for the purpose of draining land, but from which he dissents, and upon what terms of compensation, etc., §§ 79, 80, 81. This act is entitled an "Act to amend the law relating to the drainage of land for agricultural purposes," but the sanitary improvement of the neighborhood is included in that title, in the words of 9 and 10 Vict., chap. 101, before quoted.

By section 277 of 38 and 39 Vict. chap. 55 (Public Health Act, passed 11th August, 1875), "It shall be lawful for a rural authority" (as defined by the act) "by resolution to be approved by the local government board, but not otherwise, to constitute any portion of the area within their jurisdiction a *special drainage district* for the purpose of charging thereon *exclusively* the expenses of works of sewerage, water supply, or other works which by this act are, or by order of the local government board may be declared to be special expenses; and thereupon such area shall become a separate contributory place."

Under 38 and 39 Vict., chap. 89, § 9 (Loans — Public Works) the loan commissioners appointed under this act may lend money for "*any work for which a sanitary authority are authorized to borrow under the Public Health Act, 1875.*"

WITH RESPECT TO IRELAND ESPECIALLY.

By 29 and 30 Vict., chap. 40, entitled an "Act to authorize a further advance of money for the purposes of improvement of landed property in Ireland," the treasury is empowered to issue one million pounds for the purposes of that and previous acts, the object being, as stated in section 2, to make loans to any owners of lands repayable by a rent charge at the rate of five per cent per annum, but such rent charge may be redeemed according to a certain schedule annexed.

This and numerous recited previous acts are to be construed as one act.

But by 42 and 43 Vict., chap. 77, "the advances made by the public works loan commissioners, or by the commissioners of the public works in Ireland, under any one act, in any one financial year to one borrower (notwithstanding any thing in the act authorizing such loans) shall not exceed in the aggregate one hundred thousand pounds."

Further, under 44 and 45 Vict., chap. 49, § 31, the treasury may authorize the board of works in Ireland to make like advances to any *occupier*, not necessarily owner, of lands, when satisfied of the security offered to insure repayment.

And by 44 and 45 Vict., chap. 38, § 15, a grant of one million four hundred thousand pounds may be issued out of the consolidated fund of the United Kingdom, or the growing produce thereof, for the purpose of advances, or of purchases of estates by the land commissioners in Ireland.

It need scarcely be added that under the terms "land-owner" or "occupier" land improvement companies, railway, canal and water companies are comprised; but for the special powers conferred upon them in connection with private land-owners with a view to the effective operation of the drainage acts and the co-operation of such private individuals with these public bodies, see 27 and 28 Vict., chap. 114, §§ 26, 53, 54, 78-89, also (England and Ireland) 40 and 41 Vict., chap. 31, § 7. This latter act does not include Scotland, but the former embraces the whole of the United Kingdom.

HUGH WEIGHTMAN.

NEW YORK, 17th February, 1885.

Application having been made to the Attorney-General for his opinion as to the abatement of a nuisance in the village of Castleton, N. Y., the following opinion was rendered:

OFFICE OF THE ATTORNEY-GENERAL, }
ALBANY, September 11, 1884. }

To the Honorable Secretary of the State Board of Health:

SIR—Your recent communication in regard to an alleged nuisance in the village of Castleton has been received.

In reply to your request for my opinion as to the powers of the local board in the matter, permit me to say: The following facts seem to be conceded. The village authorities of Castleton have built a brick sewer in certain of the streets of said village. Such

sewer in one place has been left uncovered for about 143 feet. The local board of health have declared the sewer, in its uncovered condition, to be a nuisance, and have ordered the village authorities to cover the same. This the village authorities decline and refuse to do. Has the local board of health power to cover such sewer, and will the expense incurred by them in such work be a charge upon the village of Castleton?

This seems to be a local matter. I do not consider it the duty of the Attorney-General, as a general thing, to give opinions in such matters. Inasmuch, however, as this request comes through the State Board of Health, I feel in duty bound to express my views.

I shall assume, in this opinion, that the sewer in its present condition is an actual nuisance, and that the proceedings of the town board of health, up to this point, have been in strict conformity with the statutes in such case made and provided.

Section 4 of the act for the Preservation of the Public Health declares that in any case of non-compliance with such an order as that served upon the village authorities in the present case, the board of health may enter upon the premises and remove the nuisance, and the expense thereof shall be a charge upon the occupant of the premises, and may be sued for and recovered by the board of health in its own name.

By the construction and maintenance of this sewer in the public highway the village of Castleton, I think, became an occupant *pro tanto* of that highway, that is to say, of the premises upon which this nuisance is located, within the meaning of the statute.

It is therefore my opinion that, by reason of the failure and refusal of the village authorities to comply with the order served upon them, the local board has power to incur the necessary expense for properly covering this sewer; that it is their duty so to do; that the expense incurred in such work will be a charge upon the village of Castleton, and that an action will lie in the name of the board of health for the recovery of the same against said village as a corporation. Under the existing statutes, the amount of any judgment recovered in such an action must be assessed, levied and collected by the board of trustees of Castleton, at the same time and in like manner as other moneys for the necessary expenses of the village, in addition to the moneys now authorized to be assessed, levied and collected for that purpose.

In closing I feel constrained to say that local boards of health

have authority, within the meaning of the Act for the Preservation of the Public Health, to employ legal counsel whenever necessary, and they should do so in cases like the present. The reasonable compensation of such counsel is a charge upon their respective municipalities, and must be audited, levied and collected in the same way as other city, village and town charges are audited, levied, collected and paid.

Very respectfully,
D. O'BRIEN,
Attorney-General.

A question having arisen as to the powers of the State Board of Health to require original certificates of deaths, births and marriages to be forwarded to the State Bureau of Vital Statistics, the following opinion was rendered :

OFFICE OF THE ATTORNEY-GENERAL, }
ALBANY, *February 5, 1885.* }

ALFRED LUDLOW CARROLL, M. D., *Secretary State Board of Health:*

DEAR SIR — I am in receipt of your communication of the 3d instant submitting to me for my opinion the following questions :

1st. "Is the State Board of Health justified in requesting the boards of health organized in the cities, villages and towns of this State under chapter 324 of the Laws of 1850 as amended, to forward the original certificates of birth, marriage and death to the State Board of Health for registration and preservation in the State Bureau of Vital Statistics, as contemplated by section 7 of chapter 322 of the Laws of 1880, and as required by the rules issued by the State Board of Health?"

2d. "Are the original certificates, the form and method of registration of which is prescribed by the State Board of Health in their supervision of the State system of registration of births, deaths and marriages,—are these original certificates local records, or are they State records, to be preserved in the Capitol of the State?"

3d. "Is the board of health of the city of Albany for any special reason excepted from the operation of the general law and relieved from compliance with the rules of the State Board of Health requiring the said certificates to be forwarded to the State Bureau of Vital Statistics after local registration?"

Chapter 322 of the Laws of 1880, which is the act establishing the State Board of Health, provides at section 7, that "it shall be the

duty of the State Board of Health to have the general supervision of the State system of registration of births, marriages and deaths and also the registration of prevalent diseases. Said board shall prepare the necessary methods and forms of obtaining and preserving such records, and to insure the faithful registration of the same in the several counties and in the Central Bureau of Vital Statistics at the Capitol of the State." * * * * "The secretary of said board of health shall be the superintendent of registration of vital statistics of the State."

By chapter 512 of the Laws of 1880 it is made the duty of the board of supervisors in the different towns of the State to provide for the registration in the clerk's office of each town or village in the county of every marriage, birth and death which may occur in said town or village, such registration to be made in proper books kept for that purpose.

There is nothing in this last-mentioned act which conflicts in any way with chapter 322. The two acts are in conformity and the former is in aid of the latter.

The State Board is therefore not in any way relieved from the general supervision of the system of registration of births, marriages and deaths, and the boards of supervisors are directed to furnish the necessary means for the different towns in their respective counties to carry out the provisions of chapter 322 of the Laws of 1880, which act still leaves the *modus operandi* to the State Board of Health. And in pursuance of the authority vested in it the State Board of Health passed a resolution requiring "regular monthly returns and reports of all records (certificates of births, deaths and marriages) to be made to the State Board of Vital Statistics at the office of the State Board of Health at Albany, to comprise all the certificates of births, deaths and marriages that have been received and registered in or for the preceding month."

The manner of the registration and preservation of the records, where it is not particularly prescribed by the Legislature, is under the control and direction of the State Board of Health, which may pass any resolution concerning the matter not in conflict with the law.

A record is required to be kept in the State Bureau at the Capitol, and the different authorities in the towns are required to register the births, deaths and marriages.

To register means to keep a list or account of. And where an officer is required to register a particular document, this does not imply a power or duty to keep the original. Where an officer is required to keep the originals, the law directs such originals to be filed with him, not registered. This distinction is generally recognized in the cases of mortgages on real estate and chattel mortgages. The former are to be recorded or registered, and the register returns the original; the latter is to be filed, and the officer retains it. There is but one original certificate of each birth, death or marriage; it is from this that the officers whose duty it is to register the same in the different parts of the State take the transcript or copy. If they were to keep the original there would be no way in which the record could be kept at the Capitol, which the law clearly requires to be done.

It is necessary, therefore, in order to carry out the intention of the law as well as the order of the State Board of Health, and which order it appears clearly to me, the Board has ample power to make, that the original certificates should be sent to the Bureau of Vital Statistics, and as the law is silent as to who shall be the legal depository or custodian of the original certificates, and does not direct them to be returned by the bureau after having been recorded, I think the Board of Health, under its general power of supervision and direction, has authority to order the certificate to be filed with the Bureau of Vital Statistics.

In reference to the third question, the charter of Albany, which was passed in 1870, gave the city of Albany power to make its own regulations in relation to the public health, and the same power was given by its new charter, passed in 1883.

There was also a provision in said new charter as follows:

“This act shall not in any manner affect the powers, duties, rules, orders, ordinances or regulations of the board of health in Albany, as they exist under any law of the State.”

I am, therefore, of the opinion that the State Board of Health has power to compel the return to it of the original certificates of births, marriages and deaths by the different officers in the State whose duty it is to register the same, and that the city of Albany is not excepted, although I believe some of the larger cities are, which it is unnecessary for me to enumerate.

Very respectfully, your obedient servant,

D. O'BRIEN,
Attorney-General.

The following complaint was received at the Central office and referred to the Attorney-General for his opinion which is here given :

CENTRAL BRIDGE, SCHOHARIE COUNTY, N. Y., *July 8, 1884.*

State Board of Health, Albany, N. Y. :

GENTLEMEN— The Albany and Susquehanna Railroad Company have placed five freight cars, containing sixty men, upon their side track at Central Bridge, in close proximity to dwellings of the inhabitants. They cook, eat and sleep in the cars, and the *filth and excrement* which they drop close in the vicinity to the dwellings fill the air with a sickening stench which, the neighbors fear, will create a contagion, and is very disagreeable to inhale.

Will you give us instructions how to proceed to remove them?

The men are supposed to be Italians, came Thursday, July 3d, and say they expect to remain there until fall. If so, then people who live from thirty to fifty feet of these cars and persons will fall victims to disease, which they ask your aid in ridding themselves of.

N. LANSING.

We, the undersigned, officers of the town of Esperance, Schoharie county, fully believes each feature of the above statement to be correct and true.

M. W. STEVENS, *Supervisor.*

IRVING GROVENOR, *Town Clerk.*

G. H. VAN WAGNER, *Health Officer.*

July 9.

To the Secretary of the State Board of Health :

DEAR SIR — In the matter of the inquiry of Mr. N. Lansing of Central Bridge, this State, in relation to an alleged nuisance caused by the Albany and Susquehanna Railroad Company placing cars in which Italians cook, eat and sleep, in close proximity to dwellings, and which is alleged to fill the air in the vicinity with a sickening stench liable to create a contagion, which you referred to me for my opinion, I have to say :

That this seems to be a case where the local board of health has full power to deal with the matter of inquiry.

Subdivision 3 of section 3 of chapter 324 of the Laws of 1850, as amended by the Laws of 1881 and 1882, provides that local boards of health shall have power, "and it shall be their duty, among other things, to make orders and regulations for the suppression of nuisan-

ces, and all such other orders and regulations as they shall think necessary and proper for the preservation of the public health."

Subdivision 6 of the same section provides for special and individual cases of nuisances, and directs the method of their suppression.

Subdivision 9 of the same section gives their board power to impose penalties for the violation of, or non-compliance with, their orders and regulations, and to maintain actions in any court of record to collect such penalties.

Section 4 of the act above referred to, in case of non-compliance with the rules, regulations and orders of the board of health, by the person or corporation answerable for the existence of the nuisance, gives the board power to enter upon the premises where the nuisance exists and suppress it, or remove it, the expense of such suppression or removal being a charge upon the occupant or owner of premises, as therein set forth, and it also provides that any person who shall willfully violate or refuse to obey any order or regulation made and published, or order made and served, as provided by the subdivisions mentioned above, shall be deemed guilty of a misdemeanor, and on conviction thereof, shall be subject to fine or imprisonment, or both, in the discretion of the court, such fine not to exceed \$1,000 nor such imprisonment two years.

Section 385 of the Penal Code defines a public nuisance as "any thing that injures or endangers the comfort, repose, health or safety of any considerable number of persons, or which offends public decency."

In the case of which Mr. Lansing inquires, the local board of health, if in their judgment the presence of the carloads of Italians, as mentioned in the communication, is detrimental to public health, or offensive to public decency, should declare their presence there as mentioned a nuisance, and should serve upon the railroad company the proper notices, requiring them to cleanse the cars and put them in a sanitary condition, or remove them; and in case of non-compliance of the company, the board of health, under subdivision 9, above referred to, should impose a fine for such non-compliance and proceed under the authority vested in them by section 4 above-mentioned, to enter upon the premises and suppress or remove the nuisance, making the expense of such suppression or removal a charge against the said company; and if the company willfully re-

fuses to obey the order of the Board, they could proceed against them criminally.

You will see by the above that the local boards of health have ample power for the regulation of the sanitary condition of any premises within their jurisdiction, and having those ample powers they should exercise them in such a fearless, yet discreet manner as shall tend to the best possible preservation of the public health.

Especially now while our state is threatened with a visit of cholera should particular attention be given to cleanliness and the enforcement of the best sanitary condition of persons and premises.

Very truly yours,

D. O'BRIEN,

Attorney-General.

EFFLUVIUM NUISANCES.

The committee presents a series of reports showing the work performed under its direction during the past year. The warfare against offensive businesses has been relentlessly waged, and as far as the means of the Board would warrant.

While nuisances of this character still continue, there can be no question but that the constant revelations of our inspector, the exposure of improper modes of conducting certain business and the prompt issuance of thirty-two orders by Governor Cleveland for the closure altogether or the satisfactory modification of *modi operandum* of stench factories in this unsavory neighborhood, has resulted in the inauguration of improved methods, and the recognition of the cardinal principle of common law, that people, while at perfect liberty to embark in any business they may elect, not forbidden by the laws of the land, must yet remember that it is not permitted to so prosecute it as to infringe upon their neighbors' comfort, or to pursue it on the hypothesis that gain can be steadily striven after with an utter disregard of the right of others.

The committee still adheres to the position advocated from the beginning, that no offensive business should be allowed in populous centers, unless so conducted as to be entirely unobjectionable.

J. SAVAGE DELAVAN, M. D.,

Chairman.

It having been claimed that Fred. Hoefner had made improvements which would warrant a modification of the Governor's order, the inspector was sent to inspect the same. He reports as follows :

NEW BRIGHTON, *April 11, 1884.*

According to instructions, I have this day made an inspection of the new fat-rendering establishment of Fred. Hoefner, otherwise known as Chas. Hoefner, on Newtown creek near Penny bridge, to which the inclosed papers refer. The plant is entirely new, consisting of a frame building in which is located one iron rendering kettle, heated by a furnace in the cellar — the whole arrangement being cased in a wall of brick, with a brick chimney for the furnace fire. The kettle is provided with a close sheet-iron hood, provided

with doors and connected by means of a pipe with the furnace chimney.

If the doors of the hood are kept closed during the process of rendering, and only fresh fat used, I can see no reason to deny him the privilege of working. If the place should become a nuisance it will be from his own willful negligence.

Respectfully submitted,

ARTHUR HOLLICK,

Inspector.

The following reports of the inspector show the condition of the various establishments at the dates mentioned :

NEW BRIGHTON, *April 11, 1884.*

SIR -- I have this day inspected the stench factories of the New-town creek region, and have made memoranda as follows upon the places which may yet be called public nuisances :

John Kehoe — Fat boiler, Long Island City. This establishment was closed immediately after the service of the Governor's order last year, but is now in full blast again, without any attempt having been made to cover kettles or modify the nuisance in any way.

Eastern Distillery — Cow stables. Cattle are again confined here in the most filthy condition. For a long time after service of the Governor's order the stables were vacant and thoroughly cleansed.

Preston's Bone-burning Works — This establishment is in a sort of transition stage just now, and perhaps it is hardly fair to condemn it until completed. An entirely new plant is being put up, which, according to plan, ought to be a model one. At present it is undoubtedly a terrible nuisance.

Beran's rendering works have been removed by fire during the last fortnight, and an entirely new plant is under way. I trust the new establishment will be an improvement on the former one.

Muller's new bone-burning plant has not turned out a success, and, as at present worked, is a far-reaching nuisance. They have apparently tried to mitigate the evils which were so apparent last year, but have failed to do it, and say that most of the new works will have to be torn down again.

Benj. Rosenzweig, fat renderer, Maspeth, is boiling with open kettles, and many complaints are made by those who live and pass near to his establishment.

John Briggs, fertilizer manufacturer, has been working with meat scraps and acid, although he promised to use no animal matter whatsoever.

All the other places may be considered as having fairly or entirely complied with Executive orders.

Respectfully submitted,

(Signed)

ARTHUR HOLLICK,

Inspector.

Complaint having been made of the nuisances on the New Jersey shore of the Kill von Kull, the inspector was sent to make an examination. The following is his report :

NEW BRIGHTON, *April 12, 1884.*

SIR — I have this day visited and inspected the stench factories on the New Jersey shore of the Kill von Kull, opposite the north shore of Staten Island.

During the past two weeks the complaints have been very loud from the residents of Staten Island, and with good cause. The stench was unusually pungent and continuous, although I did not detect any unusual amount of sludge acid on the waters of the Kill von Kull.

I find that this is all accounted for by certain operations which are being conducted at the Oxford Copper Works. They are experimenting with sludge acid in certain processes where fresh acid was formerly used, and found large quantities exposed in vats or upon the ground. The superintendent stated that if the offensiveness was as serious as I intimated the process would be discontinued, as they had no desire to be a source of nuisance to any one. I think it would be well if the place was visited again in a week or so in order to see if the statements were made in earnest. It is a simple enough matter and one that the New Jersey local authorities ought to be able and willing to attend to.

In regard to the other establishments, notably the oil refineries, the entire matter is in a nut shell : Let the New Jersey authorities appoint a competent watchman for night service and I venture to say that sludge acid will never annoy us again. It is only at night, generally when stormy or foggy, that the refineries dare to discharge their sludge in an improper manner. The storage capacities are such that they can accumulate it for a month and generally by or before that time a night will come when they can, unobserved, allow it to flow out into the Kills. Constant watching is the only remedy I can suggest.

Respectfully submitted,

ARTHUR HOLLICK,
Inspector.

The following report of the health officer shows a reprehensible practice at Constable Hook :

VILLAGE OF NEW BRIGHTON, {
May 20, 1884. }

DEAR SIR — Repeated complaints of an intolerable stench from the unloading and dumping of garbage across the Kills induced me to visit and examine the grounds of the Standard Oil Co., at Constable Hook, where I found hundreds of laborers employed in filling the grounds

with garbage and swill in every stage of decomposition — five barges were unloading and others waiting their turn — and should this nuisance continue, our hotels would be emptied, whoever could would leave the line of exposure, and typhoid, and diphtheria would be the inevitable result of living in an atmosphere so strongly impregnated with these eliminations of filth. As the source of this abomination is beyond our jurisdiction, we have no other resource than the State Board of Health, and suit at law, the dumping of garbage after the first of April being in violation of the Laws of New Jersey. Please use your efforts to abate this intolerable nuisance.

By order of the Board of Health.

Yours respectfully,
THEO. WALSER,
Health Officer.

The subjoined complaint was referred to the committee for action.

BROOKLYN, N. Y., June 30, 1884.

Dr. A. L. CARROLL, *Secretary State Board of Health:*

DEAR SIR — The undersigned tax payers and residents of the city of Brooklyn desire to call your official notice to the vile and sickening odors — principally at night when the wind is east or north-east — which diffuse themselves over this portion of the city, coming presumably from the neighborhood of Newtown creek and Grand street. We respectfully ask the State Board of Health to use its *undoubted power in promptly suppressing* this abominable nuisance, and that you inform us who the offenders are and what steps you purpose taking in the premises.

Very respectfully yours,

WALTER B. CHASE, M. D.

Philip Kriezer, 896 Myrtle ave., Geo. G. Collins, Alderman 2d
Henry O. Pearce, 491 Willoughby dist.,
ave.,

Thos. J. Atkins, 631 Willoughby

Hosea O. Pearce, 655 Willoughby ave.,

ave.,

Jonathan Moore, Jr., 121 Sum-

Fred. Haslam, 453 Marcy ave., mer ave.,

Lewis R. Foote, 523 Willoughby F. C. Parker, 100 Summer ave.
ave.,

The inspector was instructed to examine into its merits and report. He made the following return :

NEW BRIGHTON, N. Y., July 8, 1884.

J. SAVAGE DELAVAN, M. D., *Chairman Committee on Effluvia Nuisances:*

SIR — According to your instructions I have made an investigation of the Newtown creek region, in order to ascertain, if possible, the source of the nuisance complained of by Dr. W. B. Chase and others, residents of Brooklyn.

The only odors which are sufficiently far reaching to annoy the complainants are, in my estimation, either from bone-burning or else from the creek itself, where sewage discharges into it at or near Grand street bridge.

There are four bone-burning establishments situated on the creek, viz: *Preston's*, at Blissville just below Penny bridge; *The Am. Carbon Co.*, on the Brooklyn side of the creek just above Penny bridge; *Myers'*, on Furman's island, and *Moller's*, on Furman's island.

Taking all circumstances into consideration I am pretty well satisfied that the trouble comes from Furman's island and that Moller is the offending party. This establishment, as I have previously reported, was entirely rebuilt last year, with the hope and expectation that it would be perfect in all appointments. It has, however, been the source of constant trouble and annoyance, owing to defects in the construction. Upon the day of my visit (Monday, July 7) there was nothing objectionable about the premises to account for any but a local nuisance, but the retorts had only just been charged with bones and the gases would not be driven off until the evening. Before making a definite report I purpose seeing some of the complainants and obtaining more definite information. The odor of burning or distilling bones is so distinctive that it can never be mistaken for any thing else. I had occasion to mention the stench arising from Newtown creek last year, and it is now worse than ever. It is *possible* that the nuisance may be traced to that. I shall endeavor to have Dr. Chase accompany me and see if he can recognize the objectionable odor. My reasons, for neglecting to mention the other establishments as probable offenders are that Prestons use the iron-pot method instead of distilling in retorts, and this is by far the least objectionable method; The Am. Carbon Co. is closed, and Myers has been very careful since last year's raid to see that his appliances for controlling the gases are in good working order.

I write to Dr. Chase to-night, making appointment to meet at Com. Raymond's office on Saturday.

Very respectfully submitted.

ARTHUR HOLLICK,

Inspector.

NEW BRIGHTON, N. Y., July 5, 1884.

It is, however, necessary to state that in spite of these undoubted improvements, the nuisance is not perceptibly abated. So much refuse has for years been discharged into the creek, that the bottom and sides are coated with the slime, and quantities still float in and out with every tide. I can only reiterate what was contained in my former report, and say that until all the adjacent marsh land is filled in and the creek thoroughly dredged and cleansed, there will be no permanent relief from the stench of the creek. In spite of the fact,

which was perfectly apparent, that the waste water discharging into the creek was almost clear, yet the characteristic stench of decaying starch refuse was as strong and persistent as ever.

Respectfully submitted,
ARTHUR HOLLICK,
Inspector.

Additional complaint about the Glen Cove works being made, the committee made a careful inspection and reported to the Governor as follows:

ALBANY, *July 31, 1884.*

To the Hon. GROVER CLEVELAND, *Governor of New York:*

GOVERNOR — The State Board of Health, as ordered by you, has already transmitted a report on the alleged nuisance produced by the operations of the Glen Cove Manufacturing Company, situated on Hempstead Bay, near Sea Cliff, L. I.

Since this report has been in your hands for executive action, the State Board of Health has received notice of improvements made, and changes in progress in the manner of carrying on the manufacture of starch and glucose, at the above mentioned works.

The State Board of Health, through its committee, and at the suggestion of the Governor, on the 26th day of July, 1884, inspected the works of the Glen Cove Manufacturing Company, and noticed the improvements that said company claimed as having made.

We have also caused a special inspection to be made by the Board's Inspector, Arthur Hollick, Ph. B., and we through our committee have made minute and careful inquiry, both at Glen Cove and at Sea Cliff, as to the present state of the alleged nuisance.

We find that great improvements have been made in the process of manufacture. The "white water," so called, that was formerly discharged into the creek, laden with organic matter and destined to become the source of an intolerable nuisance, has by an ingenious process been rendered substantially clear from offensive matter. The water now discharged into the creek, is, in the opinion of the committee, almost free from hurtful or noxious material.

The flats contiguous to the works, that at our last visit were uncovered at low tide and coated with offensive putrescent material, are now in process of being filled up with sand and gravel, thus diminishing to a great degree the nuisance before complained of.

On visiting Sea Cliff we found a general tendency amongst those who formally complained, to admit that the nuisance was being abated. Other recommendations to insure perfect freedom from causes of complaint were suggested to the company, and assurance given that such improvements would be carried out.

In view of the above statement of facts, the State Board of Health feel authorized in requesting the Governor to interpose no executive action, and as the nuisance is being abated by the Glen Cove Manu-

facturing Company as rapidly as circumstances permit, we can see no reason for executive order to the said manufacturing company.

Very respectfully,

Your obedient servants,

J. SAVAGE DELAVAN, M. D.
ERASTUS BROOKS.

MEMORANDUM IN RE BARREN ISLAND.

A. L. CARROLL, M. D., *Secretary New York State Board of Health:*

SIR — The communication which you refer to me from Lawrence, L. I., and also the inquiries which have been addressed to me by several parties concerning Barren island and its industries, have decided me to furnish a brief memorandum in relation to the same.

There are six establishments located there, viz.: Friedlaender's fish factory, Hawkins Bro's. fish factory, White's horse factory and offal rendering establishment, McManus' sludge tar distillery, Steinfel's fertilizer works, Coe's fertilizer works.

The first two named are engaged in the catching of menhaden, which are boiled, the oil pressed out and the remaining fish scrap dried in the sun and sold for a fertilizer. A large fleet of steam vessels is engaged in the enterprise, and the buildings and drying platforms cover many acres. There was another similar establishment burned down last year, belonging to Seaman, Jones & Co., which has never been rebuilt. This industry has long been established and is one that cannot be conducted in any other manner. The exposure of the scrap to the action of the sun is a necessity. The odor of fish is not noticeable for a great distance, and I doubt if it ever reaches the mainland or adjacent beaches.

The horse factory and offal rendering place of T. & A. White is one of those necessary evils which result from handling the refuse of a large city. The firm has the contract for removing all dead animals, offal, decayed meat and vegetables, etc., from New York. The work is one that must be done, and done without a day's interruption. The firm is obliged to take all that comes each day and handle it as expeditiously as possible. The odor of decaying animal and vegetable matter is always noticeable in the vicinity, and when an unusually offensive cargo is being handled can be smelt for miles.

Every thing is done that is possible to lessen the offense, and all material is rendered and disposed of the same day as received. Steinfel's fertilizer works is a sort of adjunct to White's. Meat scrap from the latter place is here mixed with sludge acid and piled in heaps until the process of disintegration is complete. Even the residents of Barren island complained of the stench from this process. Mr. Steinfels ceased mixing about the middle of June and promised

not to re-commence until autumn. A small quantity of fish is also treated here, but nothing compared to the other large fish-rendering firms. Coe's fertilizer works, although fitted up with all possible appliances for the control of offensive vapors and effluvia, is or was the undoubted source of most of the offense complained about. Large quantities of sludge acid were used and stored on the premises, and the odor of this material could often be noticed as far as East New York, in spite of the care taken in handling it. I am glad to say that this firm recognize the inevitable nuisance that they cause and have promised to neither use nor store sludge acid during the summer months. On June 25, all acid was used, none remained in store, and no more will be received until September.

McManus' sludge tar distillery — Sludge tar, which is one of the by-products from Coe's place, is here distilled for the oil it contains. The establishment is a small one and is only a slight local nuisance.

During the summer, when there is no longer a demand for the sludge acid, it is dumped out at sea, and unless the tide and wind are favorable it often finds its way to the shores. Barren island is about five miles from everywhere — that is it is about equi-distant from Rockaway, Coney Island and the mainland at Canarsie. These industries must necessarily be carried on somewhere, and if they are suitably restricted, I do not see that any better or more available place can be found, especially as all the offensive material is carried there by way of the salt water. I trust that this brief memorandum may aid in securing to you an intelligent knowledge of the island and its industries. At the close of the season I propose to give an exhaustive report as possible and a statement of how the nuisances have been affected by the promised nonuse of sludge acid.

Respectfully, etc.,

ARTHUR HOLLICK,

Inspector.

July 5, 1884.

A serious complaint having been made of the nuisance created by the Cream of Tartar works, the matter was referred by the chairman to Hon. Erastus Brooks to investigate. His report is here given:

WEST NEW BRIGHTON, N. Y., *July 12, 1884.*

TO J. SAVAGE DELAVAN, M. D., *Chairman of Committee on Effluvia Nuisances:*

SIR — I send you the report of Inspector Hollick who accompanied me by request, to the Cream of Tartar works, on the 11th instant; thorough examination of the Cream of Tartar works at Stapleton was made. The complaints of the people were widespread, and a strong feeling of indignation was everywhere manifest in the community against one of the most offensive odors which it is

possible to communicate from any known process of manufacture. The health officer, Dr. Feeny, showed me two causes of real sickness caused by these offensive odors in the persons of children in near proximity to the manufactory. The local board of health demanded a prompt closing of the works, and I am happy to inform you the demand is obeyed by the proprietors.

Very respectfully yours,

ERASTUS BROOKS,

Member of the Committee.

Hon. ERASTUS BROOKS :

SIR— I beg leave to submit the following memorandum of the inspection made this day of *A. Aaron's Cream of Tartar Works, at Stapleton, Staten Island.*

The firm is A. Aaron & Co.; office in New York, at No. 49 Cedar street; Superintendent on premises, Mr. Jacobs.

The works are located on the site of the old shot tower, near the ferry landing, and have only been established there about six weeks.

Mr Aaron was formerly a partner of the firm of Dreyfuss & Aaron, whose works at Greenpoint, Brooklyn, were a source of so much annoyance a few years since.

The cream of tartar is obtained as crude tartrate of potash, or "argols," from France. It is first ground, and then boiled in water. This operation, in the present case, is performed in partially-covered vats, and the vapors arising from these vats are the source of most of the stench complained about. It is a noteworthy fact that this peculiar and distinctive odor is more strongly noticeable at a short distance from the works than within their immediate precincts.

The resulting liquor, holding the cream of tartar in solution, is purified by means of bone black and the impurities thrown down by means of clay. The crystals are then allowed to form, after the liquor is run into the crystallizing tanks. Some vapors also arise during this part of the operation. The solid refuse is washed into a sewer connecting with the waters of New York harbor. The control of all vapors is necessary, in order to render the process as inoffensive as possible, but it is necessary to state that even where such precautions have been taken there has always been more or less of a nuisance created.

In the present instance the proprietors have been so anxious to commence work that they have begun before the plant was completed, and hence have caused a wide-spread nuisance. To-day the stench was plainly noticeable at New Brighton, at a distance of more than a mile from the works.

Respectfully,

ARTHUR HOLLICK,

Inspector.

NEW BRIGHTON, N. Y., July 11, 1884.

Renewed charges against the condition of establishments on Newtown creek and elsewhere, and the efforts made towards improvement are exhibited hereafter :

STATE BOARD OF HEALTH, }
ALBANY, N. Y., August 14, 1884. }

ARTHUR HOLLICK, Ph. B., *Inspector of State Board of Health :*

DEAR SIR — By direction of the Chairman of the Committee on Effluvium Nuisances, Dr. J. S. Delavan, I have to request that you at once proceed to Newtown creek and inspect the present condition of the nuisances there, reporting what you find to the chairman. The reason for this action you will understand from the inclosed complaint from Hinsdale & Sprague, that the “parties complained of have almost, without exception, returned to their unlawful methods of manufacture, and the orders of the Governor last year are openly violated.”

FREDERICK CARMAN,
Chief Clerk-in-Charge.

NEW YORK, August 13, 1884.

State Board of Health, Albany, N. Y. :

GENTLEMEN — Some months since Mr. Sprague appeared before you in relation to complaints against what was known as the “Newtown creek” nuisance. At the time the matter was referred to Inspector Hollick, and the result was a temporary relief from the evil complained of.

The nuisance again exists in most aggravated form ; the parties complained of have, almost without exception, returned to their unlawful methods of manufacture, and the orders issued by the Governor last year are openly violated.

Will you kindly direct a reinspection by Mr. Hollick ? He prefers that we should call your attention to the matter, that he may act under orders from you.

Very respectfully,
HINSDALE & SPRAGUE.

K.

NEW BRIGHTON, N. Y., September 4, 1884.

J. SAVAGE DELAVAN, M. D., *Chairman Committee on Effluvium Nuisances :*

SIR — According to the instructions contained in the annexed communications, dated respectively August 14 and August 22, I have made a complete inspection of the various probable sources of nuisance in the region near Newtown creek, Queens county.

The first series of inspections were made on August 19 and August 20, but owing to the publicity previously given to the proposed investigation, through the medium of the daily papers, the various interested parties were prepared, and had either closed their establishments or else made things scrupulously clean. The next investigation was begun on September 2, and completed September 3, without any previous notice having been given, so far as I am aware. Dr. Fox, of the Sanitary Reform Society, accompanied me throughout the first day.

The establishments visited were all reported upon in detail on June 28, 1883. Since then various changes have transpired and the present report shows the actual condition of each one at date.

VARNISH AND PRINTING INK FACTORIES.

Eleven of these establishments, all located in Long Island City, were reported upon by me last year, but the executive orders issued against them were not pressed, as the nuisance caused by them was not considered of sufficient importance. Modifications in the methods of manufacture were made by some, but the only earnest and successful endeavor to control all effluvia was made by Messrs. Mayer & Lowenstein, to whom due credit should be given. My previous report upon these industries will be entirely pertinent at the present time, and unless it is thought advisable to again push them, I do not think that a detailed investigation is necessary.

TRANSPORTATION OF MANURE.

This source of nuisance is very erratic — here one day and there the next — but is very manifest and disgusting when experienced. Car-loads, in transport, at various points along the Long Island railroad, and scows full of the same material, on the creek, are frequently the causes of very earnest complaint, both from passengers and residents. The only point where I found this nuisance to be a constant occurrence was on the creek at the place where the scow loads are discharged and taken on to the cars.

DUMPING OF NIGHT SOIL.

I have heard many complaints in regard to this source of nuisance, and have had the spots pointed out to me where dumping had been done. In one case the proprietor of a fertilizer factory complained that he had been accused of causing a nuisance, when in fact the source of the nuisance was a quantity of night soil which had been dumped in the vicinity a short time previously. This subject, however, is one that I think the local authorities should attend to.

FERTILIZERS, BONE BURNING AND BONE BOILING.

Henry Elkens — Place deserted and “to let.”

John Briggs.—Place closed; no signs of work having been done there for a long time. Was informed that he had "sold out and gone to Jamaica."

Geo. W. Baker.—Establishment scrupulously neat and clean. No decaying or fresh material is used on the place—all is treated before being received. Most of it is bone and hair mixed with lime, from Cooper's glue factory. The strong odor noticed from this establishment is caused by drying this material in the sun.

C. Meyer.—This was formerly one of the worst places in the whole region, but the following improvements have been put into successful operation and have changed the place from a wide reaching into a mere local nuisance.

1. The bone tar is burned into lamp-black.

2. The gases from the sulphate of ammonia saturating vats are conducted into the chimney and burned.

3. The bones, after boiling, are washed clean of all meat scrap before being stored, and the scrap is either pressed into cakes or else mixed with bone-black and made into a fertilizer.

4. The use of sludge acid has been entirely discontinued and only fresh acid used.

Considerable credit is due to Mr. Meyer for having conducted experiments to a successful issue which his neighbors have not been slow to profit by.

Preston Bros.—Undoubtedly the greatest change is to be seen in this establishment. They claim to have spent some \$8,000 in improvements. Most of the old buildings have been torn down and replaced by new ones. Meat scrap, formerly dried on top of the furnaces in the open air, is now dried by steam in a close revolving cylinder, and all moisture, gases, etc., carried into a condenser by means of an exhaust blower. The room in which the bone boiling is carried on has a solid concrete floor, graded to the center, where it connects with a sewer leading to the creek. This is washed down after every boiling. The room is connected with a powerful exhaust, worked by a thirty-five Sturdevant blower, which is claimed to draw the entire atmosphere of the room out every four minutes and force it either under the furnace as a blast, or else through the condenser and into the chimney. The manufacture of fertilizers has been discontinued. It is next proposed to pave the yard with stone so that that also may be washed down when deemed advisable.

Reed & Co.—This entire establishment is about to be torn down and a new factory built further up the creek. They promise to make it a model affair, and to follow any suggestion made that will tend to obviate any possible source of nuisance.

J. & C. Muller & Co.—This plant was newly erected last autumn in the site of the old one. It has not fulfilled expectations and is undoubtedly the source of considerable of the odor noticed in that region. The sulphate of ammonia saturating-vats are not properly covered; the pipe connecting them with the chimney for the purpose of carrying off the gases is broken; the boiled bones are not

washed, but are stored with the meat scrap attached to them, and this soon becomes putrid in warm weather. I was told that the defects would be remedied, and even that the contracts had been given out for repairs to pipe, etc.

OFFAL RENDERING.

Henry Beran.—The place reported upon last year was burned down, and the present plant is only just completed. Every thing possible has been done to make the place as inoffensive as may be. The prompt handling of the material is now the great desideratum, and steam power is to be put in so as to accomplish this. A patent dryer is also to be used, so that all meat scrap will be dried in a closed cylinder similar to the one now used by Preston Bros. During the mean time the scrap will be sold and shipped away each day without drying.

Benj. Rosenzweig.—Place closed, but am informed that he works nights and is a terrible nuisance to the neighborhood.

Simon Steinfelds.—Place closed and deserted; no signs of any work having been done for an indefinite time.

Peter McArdle.—Every thing has been done that was required.

Walter Bownes.—Place closed; no signs of work; says he has gone out of the business.

FAT RENDERING.

John Kehoe.—No pretense has been made of putting in any improvements, but work has been carried on, boiling in open kettles, intermittently, ever since last summer. He was working on September 2d.

Fred. Hoffner.—The building reported upon last year was burned down and the stock destroyed by the sheriff. The new building is an improvement on the old one, and the kettle is provided with a cover and connected with the chimney flue. It would be a still further improvement if the chimney was raised about five feet above the roof or extended by means of a sheet-iron pipe, so as to be above the level of the passenger trains on the railroad.

Geo. Ackerman.—Has complied with all requirements.*

MISCELLANEOUS.

Barnett's & Livermore's starch factories have accomplished what they could, and have fairly abated their share of the general nuisance of the region.

Gaff, Fleischman & Co.'s stables have been all removed, and the place laid bare to the air and sunshine.

From these memoranda it will be seen that the parties most to blame at the present time are *Kehoe, Rosenzweig and Muller.*

*I neglected to mention that the fat-boiling establishment of *Kirkman & Sons* is closed and falling in ruins.

The general improvement since last summer can hardly be appreciated without having seen all these establishments at their worst. The creek itself is now the most offensive nuisance of all, fouled as it is from sewerage and oil refuse. Even the total cessation of all industry along its borders would not render it clean. The only remedy would be bulk-heading and dredging so that there would be no mud flats along its borders to be alternately overflowed by the tides and baked by the sun. I understand that Brooklyn is already taking steps to divert its sewage from the creek into some other channel. If this be so, I venture to say that the most prolific source of nuisance from the region will be eliminated.

Respectfully submitted,

ARTHUR HOLLICK, Ph. B.,
Inspector.

BROOKLYN, N. Y., *October 1, 1884.*

Dr. A. L. CARROLL, *Secretary State Board of Health of New York, Albany, N. Y.:*

DEAR SIR — About three months since Hon. George C. Collins, Hon. Joseph C. Hockee, Messrs. Hosea, O. and Henry O. Pearce, Rev. Lewis R. Foote, other gentlemen and myself, complained to you of the sickening odors coming from the neighborhood of Newtown creek and Grand street. By your order the complaint was referred to your special inspector, Arthur Hollick, Esq., for investigation and report.

Mr. Hollick subsequently informed me that the nuisance complained of arose from the bone-boiling establishments in the locality already referred to. From that time until recently there had been scarce any reason for complaint, and the community was congratulating itself on its escape from a very serious annoyance.

But unfortunately for a few days past, when the wind is easterly or north-east, the abominable smells have returned. During the early hours of this morning and at this hour, 10 A. M., the stench is *terrible*.

In view of the undoubted powers with which the State Board of Health is invested, I again appeal to you for myself and family and the community in which I live that you take *immediate* and *decisive* steps to *permanently suppress* the nuisance.

I believe it no exaggeration to state that the comfort and health of *more than one hundred thousand people depend upon your action.*

Very truly yours,

WALTER B. CHASE, M. D.

NEW BRIGHTON, *October 8, 1884.*

A. L. CARROLL, M. D., *Secretary New York State Board of Health:*

SIR — The annexed communication from Dr. Chase is similar to the one received in the early part of the summer from the same

gentleman. I am at present making night inspections along the creek, and will pay special attention to the region around Grand street. You may expect a report by the end of the week.

Respectfully submitted,

ARTHUR HOLLICK,

Inspector.

NEW BRIGHTON, *October 8, 1884.*

A. L. CARROLL, M. D., *Secretary New York State Board of Health:*

SIR — The annexed communication from Lawrence, L. I., which you refer to me for investigation and report, is what I expected we should hear in some way or another, now that work has begun again at Barren island. It is significant that the previous complaint was made just prior to the time that certain factories agreed to cease working for the summer; that no complaint was heard during the time that I made regular weekly inspections and found work stopped; and that complaints are coming in again now that work has been resumed. I am engaged in making my report upon the summer's work on Barren island, and shall make another visit, now that the factories are in full blast, before completing it. This report will be forwarded next week and will show the condition of affairs as they have been since I started in last June, and how they are at the present time.

Respectfully submitted,

C. A. HOLLICK,

Inspector.

NEW BRIGHTON, *Oct. 10, 1884.*

A. L. CARROLL, M. D., *Secretary New York State Board of Health:*

SIR — On the evening of Tuesday, October 7, and Thursday, October 9, I made a tour of investigation along Newtown creek. for the purpose of ascertaining which establishments, if any, were working at night.

Through Blissville, as far up as Penny bridge, I found every thing quiet and all places closed. All the watchmen with whom I conversed stated that no work was ever done after 6 P. M.

At the upper end of the creek things were a little different. *Benj. Rosenzweig*, fat boiler, Maspeth, was boiling in open kettles about 9 o'clock on Thursday evening. I noticed the odor as far down as the Grand street bridge. The bone-burning establishment of C. Meyer and J. & C. Muller & Co. were in full blast of course—they always work at night. I see no reason to change my previous report on these establishments. The Mullers are not as careful as they should be, and have not taken any pains to render their place as inoffensive as they might do. The complaints made by citizens

of Brooklyn I believe to be well founded, and think it probable that Muller's factory is the chief offender. Before pronouncing upon this definitely, however, I should have to experience the particular odor complained about, as it *may* be due to some nuisance within their own precincts. The odor from the creek itself, where Brooklyn discharges a quantity of its sewerage, is often fully as offensive as any factory in the region. I will communicate with the parties in Brooklyn who complained (Dr. W. B. Chase and others), and endeavor to pin them down to something definite.

Respectfully submitted,

C. A. HOLLICK,

Inspector.

NEW BRIGHTON, N. Y., *October 24, 1884.*

A. L. CARROLL, M. D., *Secretary, New York State Board of Health :*

SIR — I have just returned from a tour of inspection in the neighborhood of Furman's island, Newtown creek, in company with Dr. Walter B. Chase, of Brooklyn. My object in having him accompany me was to see if he could identify, in or near any of the establishments visited, the odors complained of in Brooklyn. He declared that the odor of burning bones was unmistakable, and also that the "Newtown creek odor" was often very distinct. This latter is due mostly to Brooklyn sewage, and is most noticeable in the region of the Grand street bridge. This visit has satisfied me, especially when in conjunction with my night inspections of October 7 and October 9, that the establishments of Muller & Co. and C. Meyer, on Furman's island, are to blame. The latter has made conscientious attempts to mitigate the evils, but I doubt if a bone-burning plant can be constructed which will not be more or less of a nuisance.

I understand that Dr. Chase intends to communicate with you further.

Respectfully, etc.,

ARTHUR HOLLICK,

Inspector.

REPORT UPON BARREN ISLAND AND ITS INDUSTRIES.

NEW BRIGHTON, N. Y., *October 31, 1884.*

A. L. CARROLL, M. D., *Secretary New York State Board of Health :*

SIR — The following report upon Barren island and its industries is compiled from memoranda taken during an extensive series of inspections, commencing June 21, and ending at date. Inspections were regularly made twice a week, until September 21, and at

such other times as special occasion required or circumstances rendered advisable.

Barren island is situated in Jamaica bay, about midway between Rockaway Beach and Coney Island. The nearest point of consequence to the mainland of Long Island is at Canarsie, a distance of some four miles, with which point it is connected by means of a steam ferry. Nearly all the passenger traffic passes this way. The bulk of the freight and all material used in the manufactories is shipped by way of the lower bay and Rockaway inlet. The location is well adapted for the industries which are carried on there, being entirely surrounded with water, about four miles distant each way from Rockaway, Coney Island and Canarsie, and able to transport and receive all its offensive material by way of the salt water. The land consists of sand dunes with a fringe of salt marsh on the northern and western edges, and a narrow strip of the same through a depression in the middle, where a salt creek runs about two-thirds the length of the island.

The tides wash the shores daily and the porous soil renders any surface accumulation of offensive matter almost impossible. There are about a hundred dwellings on the island besides the factories, hereafter described, with their various outbuildings. The number of permanent residents is about four hundred, all deriving their living directly or indirectly from the industries located there. During the busy season in the summer many other workmen find temporary employment there.

The following establishments are now located there and are in full working order :

Friedlaender's Fish Factory, Barren Island Manufacturing Company, 137 Duane street, New York.

White's Fish Factory and Offal Rendering Works, P. White's Sons, 41 Peck Slip.

Hawkins' Bros. Fish Factory.

Coe's Fertilizer Works, E. Frank Coe, 16 Burling Slip.

Steinfels' Fish Factory and Fertilizer Works, Barren Island Bone Company.

The Fish Factory of Seaman, Jones & Company was burned down last spring, and McManus' Sludge Tar Distillery is closed.

The first mentioned (Friedlaender's) is engaged exclusively in the manufacture of fish oil and fish scrap. They own a fleet of four steam vessels which are constantly engaged, from May to November, in supplying fish for the factory.

In conclusion I would call attention to the fact that these industries *must* be carried on *somewhere*, and that Barren island is the best locality for the purpose within a reasonable distance of New York. The various hotels and other buildings at Coney Island and Rockaway, from which complaints are occasionally heard, have been mostly built *since* the industries were established on Barren island and they have located there knowing the inevitable nuisance that would occasionally occur when the wind was in the right direction. That Barren island is always more or less of a nuisance there is no denying, but the question arises whether the nuisance would be alleviated or augmented by scattering the various industries in several different localities. My own opinion is that they are better concentrated at one place.

Respectfully submitted,

ARTHUR HOLLICK,

Inspector.

NEW BRIGHTON, *December 3, 1884.*

A. L. CARROLL, M. D., *Secretary, New York State Board of Health :*

SIR — According to your instructions I have spent this day with Mr. Henry McManus, who is conducting experiments with “sludge acid” at the laboratory of the College of the City of New York. His object is to discover a method or series of methods whereby the sludge acid may be “separated” and marketable products obtained, so that there shall no longer be any temptation to get rid of it by dumping at sea or in the harbor. After patient investigation I must say that he has not brought forward any new facts or developed any new ideas. The method which he illustrated to-day is essentially that now in use by Mr. E. Frank Coe, at Barren island, and consists in mixing sludge acid with about one-eighth its bulk of water, in a closed vessel, connected by pipe with a condenser. Upon applying a gentle heat the water takes all the acid and sinks to the bottom of the vessel, while the light tar and oily refuse rises to the surface. By means of a stop-cock the acid is drawn off and the tar remains behind. In the experiment conducted to-day the acid thus separated was forty-five degrees Beaumé and the tar, while warm, about the consistency of ordinary molasses. This, however, rapidly hardened in the cold and would only just flow when in considerable bulk. During the process of separation sulphurous fumes were evolved in quantity, which would require great care to control and

render inoffensive. This part of the process is what would occasion the most offense, as it is here that the noxious gases are driven off and the characteristic odor of "sludge" evolved. In practice this is what actually takes place when the sludge is dumped into our rivers and harbors.

Mr. McManus proposes to utilize these fumes by making them pass through a solution of ammonia — forming sulphate of ammonia, potash, etc. Sludge acid is used to mix with the material and convert the phosphates into super-phosphates. The most extensive arrangements have been made for controlling all the vapors arising from the mixing and storage of sludge acid. All the tanks and mixing chambers, as well as the galleries through which the freshly-mixed material is carried, are covered and connected by wooden box conduits with a condenser, to which the vapors are forced by means of a fan blower. The condenser is a wooden chimney, fitted up with a series of shelves like a fish ladder. A constant stream of cold water, in the form of spray, enters at the top, and the gases and vapors enter at the bottom. In spite of these precautions, however, the odors are often strongly noticeable for a considerable distance. The storage tanks are also used for separating chambers for the sludge acid. Water is pumped in, the acid sinks and the tar rises to the surface, whence it is drawn off through open gutters and distributed as needed. Part is used, mixed with ashes, for filling in behind bulk-heads. It makes a tough and almost indestructible concrete, excellent for a water front that is washed by strong tides. Part is used as fuel under the boilers and the remainder is burnt in a large chimney specially erected for the purpose. Attempts have been made to manufacture lamp-black and distil oil from this material, but so far without financial success. On June 21 Mr. Coe voluntarily ceased mixing at the factory and did not resume until September 21, so that during the summer the place was practically at a standstill, with the exception of shipping the material on hand. A source of nuisance that is often unjustly credited to Barren island arises from the sludge acid which is dumped at sea by the oil company's boats. When the wind and tide happen to be in the right direction the beach at Barren island and Rockaway is often covered with the tar, especially if the boats do not take the trouble to go out far from land before discharging their cargoes.

The separated acid finds an easy market and fair price for the manufacture of superphosphates or for many purposes in which crude acid may be used.

The tar it is proposed to utilize by distillation — producing an oil which may be used for paint and leaving, as an ultimate result, a hard asphalt or coke, according to how far the distillation is continued.

I should very much doubt if all these various operations can be conducted on a large scale without producing a nuisance. The in-

evitable presence of such an amount of offensive material as this would imply is a serious matter in itself, and only the greatest care in handling and storing could obviate a serious nuisance.

Respectfully submitted,

ARTHUR HOLLICK,

Inspector.

ANTICIPATING CHOLERA.

TRANSACTIONS OF AMERICAN PUBLIC HEALTH ASSOCIATION AND
NATIONAL CONFERENCE OF STATE BOARDS OF HEALTH

BY

HON. ERASTUS BROOKS.

TO DR. EDWARD M. MOORE, *President of the New York State Board of Health:*

MY DEAR SIR — As delegate by appointment to the Tenth Annual Meeting of the American Public Health Association, and as president of the Conference of the State Health Boards of the United States, it becomes my duty to report to the New York State Board of Health as follows:

The two bodies herein named, though composed largely of the same persons, are distinct organizations. The first, as stated in the constitution, is organized for the advancement of sanitary science and the promotion of organizations and measures for the practical application of public hygiene. The second body was organized in the city of Washington in June 1884, and its chief purpose is to secure, as far as possible, uniform and harmonious action among the several State Health Boards of the country, and to encourage each other by correspondence, discussions, investigations and reports, and in such practical and steady work as will secure the best results in regard to the health of the whole people.

Twenty-six of the State Boards of Health were represented in the two conventions held at St. Louis from the 13th to the 17th of October inclusive. Both bodies while acting apart were in perfect harmony, and the chief distinction between the two was in the enlarged and general National, State and Inter-National scientific work of the one, and the practical, specific, and State Health work of the other.

A special session of the former body was set apart to hear reports and discussions from the latter organization, and the several delegates from all the States represented reported as to the work already done, being done, and proposed in the different States in the country. Better service, better health and an increased interest among the people were the chief objects urged upon each other in the discussions. All the reports submitted, verbal and written, showed a growing and more intelligent interest in the great questions connected with the health of the people. The saving of life and health was discussed both as a question of personal comfort and in its great economic value to the States, the Nation, to communities, to organizations, and to citizens generally.

The one subject which excited the greatest interest was the renewed appearance of cholera in different parts of Europe, and the apprehended and expected re-appearance of this great affliction in the United States in 1885. In different papers the rise, origin, growth and causes of the disease were presented, and, as far as known, the remedies for the prevention, mitigation and removal of this wide-spread calamity. Especially was the fact dwelt upon that the disease was found specifically in old clothes worn or concealed, in tangible filth, capable of removal by proper disinfectants or by fire, in unventilated trunks, garrets, in bundles of imported rags, in sinks, cellars, yards, cess-pools, and in like combinations and accumulations. Whatever may be said of germs or poisons in the human body the conviction is that outside the human body are, as a rule, positive preventatives of cholera, in the thorough cleanliness of homes, workshops, public places and surroundings, and especially in the persons of all classes and conditions of people. Panic is a public enemy and almost a personal crime in the effect it has upon timid minds and on persons afflicted by infirmity or disease.

The undersigned believes from the best information he has from the New York sea-board and from local boards of health, that this State will by proper warning and timely action and enforced temperate living be ready to meet this common enemy when it appears.

Preparation for all possibilities is alike a public and a private duty. It is possible for science to detect all causes and all remedies for cholera, and by the aid and blessing of Providence it is also possible for human skill to diminish, if not destroy, this dreaded disease.

The filthiness of Paris,—and the city of London is, if possible, more filthy than Paris,—is a warning to the people of the United States, and there are places in our own State where the waters are a

source of pollution,' and where the streets, alley-ways, yards and houses abound in filth.

What is done in the State and in the United States in the form of preparation for the worst should be done quickly. Every citizen in his own home and place of business should become at once a practical sanitarian. In the four cholera visitations at New Orleans, between 1832 and 1855, the deaths numbered 51,300. This fearful warning after a long time proved equal to the necessity of proper sanitary organizations to meet and fight the disease if it comes again. Whatever the causes or sources of this evil, public and private duties are now made so plain that they cannot be neglected, and must be enforced.

What the cholera is costing Europe in health is beyond human calculation. The known fatal cases in Italy alone during the visitation of 1884 to the first of November, numbered 14,928. In the city of Naples there were 6,629 deaths, and in the province of Naples 14,137 cases and 7,576 deaths. In money the cost, chiefly from terror is placed for the continent of Europe for ten months at nearly \$25,000,000. Its introduction into Paris increased the alarm, the mortality and the suspension of business. It returned to Paris in November of the present year, not without warning, but the warning was unheeded until the disease appeared in Paris. As a present warning to the United States it may be stated that there was no timely official inspection of unhealthy dwellings or hospitals though cases of cholera were found at Paris in June and July.

To show the necessity of calmness and promptness in the kind of work to be done it is proper to state that during the summer, and first month of autumn in Italy, the number of cases of cholera reported was 19,762, and the number of deaths from cholera 9,824. In France also and elsewhere the epidemic in Paris proved to be the real Asiatic cholera.

In the needed work for timely preparation the United States Conference of Health Boards at their meeting in St. Louis voted to meet in Washington on the 10th of December, to ask Congress and the President of the United States to name a suitable national commission, and to make a proper appropriation of the public money, and the power to report when and where preparation and action become necessary for the common safety of the people. The President of the United States in a communication to the undersigned promised to give careful consideration to the suggestions named in this report.

MEETING AT WASHINGTON.

The conference of State and Municipal Boards of Health from the United States and Canada, was held in the city of Washington on the 10th and 11th of December, 1884. The following report gives in brief the more important transactions of the National Conference:

The undersigned was made presiding officer of the conference by a previous election and continued in the same place for the years 1884 and 1885, the conference having finally adjourned to re-assemble at the call of the president and secretary. Dr. J. N. McCormack, secretary of the State Board of Health of Kentucky, is the secretary of the conference at the present time, and has served at the three meetings held since June, 1884, when the National Conference was first organized in Washington. At the December meeting just held delegates were present from twenty-five States and from several municipal and more local boards of health. The New York and Brooklyn boards of health were represented by Dr. Smith, the quarantine commissioner, and by Dr. Raymond, the secretary of the Brooklyn board. From the States of Ohio and Pennsylvania, where there were no State Boards, delegates were commissioned from two or more of the large cities of the State.

By a vote of the conference the president was authorized to name three standing committees in the interest of public health to receive petitions, resolutions and motions upon the following subjects, and to report upon them from time to time during the sessions of the members:

1. A committee on Federal or Congressional legislation, and inter-State and quarantine work.
2. A committee on subjects requiring State action or consideration.
3. A committee on municipal, county and town action.

The action of these three committees was limited to the consideration of questions relating to the public health. Before reports were made the members of the conference were invited to meet the President of the United States at the Executive office in the President's official home. Each of the delegates was kindly received by the President and by Hon. Frederick T. Frelinghuysen, the Secretary of State.

The purpose of the visit to Washington was stated in a brief address by Mr. Brooks and responded to in cordial words of welcome and interest by the President and the Secretary of State.

An invitation also came from the Secretary of State and from the Secretary of the Treasury, Mr. McCulloch, for a business presence

and discussion as to proposed measures of legislation and the work needed from Congress and from the Executive to prevent the introduction of cholera into the United States, and the best methods of meeting the scourge if it should force its way into the country.

The Secretary of the Treasury invited the committee on Federal action to meet him at his office in the Treasury building and the Secretary of State at his rooms in the State department. The former expressed the deepest interest in the subject of imported rags in connection with quarantine laws and regulations; upon the proper disinfection of old rags when coming from infected ports or places, and upon proper officers and proper times and places for disinfection and examination.

The strong statement was made in a dispatch from Augustine Smith, of New York, to the president of the conference that there was no evidence, or statement by authority, that cholera had ever come through or from imported rags, nor had the scourge broken out in any paper mill of the country. The correctness of this statement being questioned by the Secretary of the Treasury, and reference being made to the superintendent of the Marine department, Dr. Hamilton, in charge of Federal quarantine work, who was present with the secretary, the latter stated that small-pox had come into the country by the importation of old rags. The judgment of all present was that imported old rags ought to be disinfected either at the place of departure, or landed in some safe place for disinfection in the United States before their distribution. The quarantine commissioner, Dr. Smith, one of the seven members of the committee, in response to questions from the Secretary of the Treasury, took the most prominent part in this discussion.

At the conclusion of this conference the secretary placed in the hands of the committee the annexed paper or circular (marked "A") for their consideration and approval, and invited further advisement upon the subject, which was continued by correspondence, and finally left to the judgment of the Secretary of the Treasury. The new circular will be sent out on or about December 20.

The Secretary of State took the deepest interest in the subject before the conference and assisted the committee, with his chief assistant secretary, in framing the annexed proposed law (marked "B"). Section 6, giving extraordinary power to the President of the United States "in the event of any sudden emergency threatening the importation of contagious diseases into the United States from any foreign country," was framed by, or recommended by the

Secretary of State himself, and approved by the committee and conference.

Consultations were also held with Dr. Hamilton, now in charge of the Federal quarantine administration, with the committee on public health in the popular branch of Congress and with other members of the United States Senate and House of Representatives upon the necessary legislation to meet the possible emergency in the event of the introduction of cholera, either by land or sea, from foreign countries, ports or places.

Unfortunately for the country the present National Board of Health, though composed of some of the oldest and ablest members of the medical profession, had become involved in much discussion upon questions of law, rights and duties with those who are not its members. At the last session of Congress this board failed to secure appropriations for conducting the necessary work of a National Health Board. The money appropriated to the extent of \$100,000 was placed in the hands of the President.

By the advice of intelligent, disinterested and prominent officials, who are men of rank, and by those not in the U. S. service, the law now submitted was framed so as to make a national board to be selected chiefly from sanitarians in the health boards of the United States. Its members are to be selected by the President of the United States and confirmed by the United States Senate. In framing the law care has been taken, as far as possible, to divest the board of all possible personal patronage of its members. A single executive officer and his necessary clerical assistants, are to be in Washington as in the New York State Board. The secretary and his clerical assistants reside in Albany. These are the only persons to receive pay, except for actual expenses, and \$10 each day to be paid when members are summoned on special duty.

The following eleven propositions after careful consideration were reported from the committee on State work, and unanimously adopted by the conference :

First.—That all surface wells should be closed at the earliest possible moment, and that great care should be taken that the water supply of all cities, towns and villages shall be of undoubted purity.

Second.—That all privy-vaults should be abolished wherever water-closets can be supplied, and that wherever the existence of such vaults is necessary that they should be rendered water-tight in such a manner as to prevent the saturation, not only of the ground surrounding them, but also of the materials of which they are built,

and that the contents of such vaults should be kept constantly disinfected, and removed to a proper place at frequent intervals.

Third.—That all stagnant ponds, when practicable, should be disinfected, and when possible the water removed by drainage or pumping, and further accumulation prevented by filling with fresh earth, or other material free from garbage or filth.

Fourth. — That great care should be exercised to keep at all times clear and free from obstruction all sewers, into which passes the refuse from dwellings, factories and other buildings, and that such examinations should be made as will detect imperfect plumbing in all buildings and the defects immediately corrected. In this connection special attention is directed to the necessity for the thorough ventilation of all soil and waste-pipes, and to the dangers connected with untrapped and unflushed soil-water and overflow-pipes.

Fifth.— That extraordinary care should be exercised in reference to all tenement-houses, lodging-houses, and in general, all places where large numbers of human beings congregate, that no accumulation of garbage or other filth be permitted in cellars or yards, and that frequent and thorough cleaning and whitewashing of such structures be required; and that householders should frequently and thoroughly examine their yards, cellars, closets and other out-of-the-way places, to see that no filth of any kind has been deposited there.

Sixth.— That the food supply be vigorously watched to exclude from the market all unwholesome meat; all milk adulterated or from diseased animals; and all unripe fruits and vegetables; and that cow stables be kept at all times clean, well whitewashed and free from all excremental accumulations.

Seventh.— That all garbage, kitchen and household refuse should be promptly removed from dwellings, stores and other buildings to a proper place, where it may be destroyed by fire or otherwise disposed of in such manner as to occasion no nuisance.

Eighth. — That such material should never be used in the filling of lots or disposed of by throwing the same in streets or vacant property where it may decompose and exhale offensive and deleterious gases.

Ninth.— That the attention of the authorities of all institutions, both public and private, and of individuals as well, be drawn to the great importance of maintaining a habit of personal cleanliness in the persons under their charge, as being one of the most efficient means of warding off an attack of cholera, or if it has once appeared, of greatly reducing its virulence and fatality.

Tenth.—Should the cholera appear in any place in this country, the health authorities of the place should have immediate notice of the first cases in order that prompt action may be taken for the complete isolation and disinfection.

Eleventh.—That all authorities of States, cities or villages be urged to adopt the measures which will result in the amelioration of all conditions such as have been referred to in the foregoing propositions, with the warning that, in the opinion of this conference, such conditions, if permitted to continue, will greatly promote the spread of cholera when it comes, and with the assurance that, if requisite measures are promptly taken to remove them, the disease will be less likely to attack a community so prepared, and if attacked, such a community will be better able to cope with the disease and to reduce its ravages to a minimum.

It was held that the full proceedings of the conference be sent to each of the health boards of all the States as soon as they can be collected and printed.

The conference by vote invoked the aid of the New York State Board and of all State municipal boards to secure, at least in spirit and purpose if not in letter, the passage of the bill now placed in printed form before members of the two houses of Congress.

Respectfully submitted,

ERASTUS BROOKS,

Chairman of the National Conference of State Boards of Health and Delegate from the N. Y. State Board of Health.

[A]

IMPORTATION OF OLD RAGS.

The Secretary of the Treasury has prepared a circular modifying all previous regulations in reference to the importation of old rags, as follows:

No old rags shall be landed in the United States except upon disinfection, as provided for in this circular.

Either of the following processes will be considered a satisfactory method of disinfection of old rags, and will entitle them to entry and to be landed in the United States upon the usual permit of the local health officer:

1. Boiling in water for two hours under a pressure of fifty pounds per square inch.
2. Boiling in water for four hours without pressure.

3. Subjection to the action of confined sulphurous acid gas for six hours, burning one and a half or two pounds roll brimstone in each 1,000 cubic feet of space, with the rags well scattered upon racks.

Disinfection in the bale by means of perforated screws or tubs, through which sulphur dioxide or superheated steam at a temperature of not less than 350 degrees, shall be forced under a pressure of four atmospheres for a period sufficient to insure thorough disinfection.

Old rags may be landed and stored at such places as may be fixed by this department for the purpose of undergoing any of the processes of disinfection before named, and, upon the completion of such process to the satisfaction of an inspector of customs and the local health officer, the rags may be delivered to the importer or consignee.

Old rags may be subjected to disinfection by either of said processes in any other country where this department may appoint an inspector to superintend the same, whose certificates of such disinfection shall be authenticated by a United States consular officer according to Department Circular No. 61, of April 22, 1884.

[B]

To amend an act entitled "An act to prevent the introduction of contagious and infectious diseases into the United States, and to establish a National Board of Health."

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that an act entitled "An act to prevent the introduction of contagious and infectious diseases into the United States, and to establish a National Board of Health," approved March 3, 1879, be so amended as to provide that there shall be established a National Board of Health, to consist of one member from each State Board of Health now established, or which may be hereafter established in the United States, to be appointed by the President and confirmed by the Senate, whose compensation, when actually engaged in the performance of duty under this act, shall be ten dollars per diem each, and reasonable expenses. This board shall meet in Washington within ninety days after the passage of this act, and shall meet in Washington annually, and in case of emergency, upon the call of its chair-

man and secretary, or upon the extraordinary call of the President of the United States, as hereinafter provided.

The officers of this board shall be a chairman and secretary. The secretary shall be the executive officer of and *ex-officio* a member of the board, and shall devote his entire time to the duties of the office, and may be removed for cause at any regular meeting of the board, two-thirds of the full board voting therefor, and shall receive such salary as may be determined by the board. The chairman, with six other members, representing the various geographical divisions of the country, shall constitute the executive committee of the board, to be elected at the first meeting of the board, and at each annual meeting thereafter, and said committee shall, and is hereby authorized to exercise such powers as may from time to time be conferred upon it by the board.

§ 2. The duties of this board shall be, and it is hereby authorized and given power to make, or cause to be made, such investigations at any place within the United States, or at any foreign port or place, and to collect information upon all matters relating to the public health, and to frame such rules and regulations as may be necessary for the government of the quarantine service of the United States; and all the power and authority now provided by law, or which may be provided by law, for the control and protection of the public health of the United States, shall be and are hereby vested in said board, except as to the special authority vested in the President of the United States under the provisions of this act. The rules and regulations of this board shall severally be executed, under the direction of this board, by such departments of the government, or other officers, as the law may prescribe or the President may designate.

This board shall co-operate with, and so far as it lawfully may, shall aid State and local boards of health in the enforcement of the rules and regulations of such boards, to prevent the introduction of contagious and infectious diseases from foreign countries into the United States, and into one State from another (and at such ports and places within the United States as have no adequate quarantine regulations under State authority, necessary to prevent the introduction of contagious and infectious diseases into the United States from foreign countries or into one State from another, this board shall, when necessary for the protection of the public health, report the facts to the President of the United States, who shall, if in his judgment it is necessary, direct this board to make such rules as are

necessary to protect the public health, which, when so made and approved by the President, shall be promulgated by this board and enforced by the sanitary authorities of the State, where the State authorities will undertake to enforce the same; but if the State authorities shall refuse or fail to enforce such rules and regulations, the President may appoint a proper person or persons for such purpose, to act under the direction of this board).

§ 3. It shall be the duty of this board to make such rules and regulations as are necessary to be observed by vessels at ports of departure, where such vessels sail from any foreign port or place to any port or place in the United States to secure the best sanitary condition of such vessel, her cargo, passengers and crew, and to prepare from time to time for the consular officers of the United States, and for the medical officers serving under this act at any foreign port, and otherwise make publicly known such rules and regulations, which, when approved by the President and issued by the Department of State, and posted in the office of the consul or other representatives of the United States at such foreign ports for at least ten days, shall be enforced by the consular officers and agents of the United States.

§ 4. It shall be unlawful for any vessel from any foreign port or place to enter any port in the United States, except in accordance with the rules and regulations made in pursuance of this act, and of the rules and regulations made under State or municipal authority, and any such vessel which shall attempt to enter any port of the United States in violation thereof shall be liable to process in the proper district court of the United States, and upon conviction, shall forfeit to the United States a sum to be awarded in the discretion of the court, not exceeding \$1,000, which shall be a lien upon such vessel to be recovered upon proceeding in the proper district court of the United States, in accordance with the rules and laws governing cases of seizure of vessels for violation of the revenue laws, and in all such cases the United States attorney for such district shall appear on behalf of the United States; and all such vessels shall obtain from the consular or authorized medical officer at the port of departure, a certificate in duplicate, setting forth the sanitary history of said vessel, and that it has in all respects complied with the rules and regulations of this board, made in pursuance of this act for the government of such vessels, and before granting such certificate such consular or medical officer is required to be satisfied that the statements therein made are true; and upon the request of this board, the President of the United States is hereby authorized to

appoint proper medical officers, to serve in the offices of the consuls at any such foreign ports, to make the inspections and give the certificates herein required.

§ 5. Such vessels shall observe all rules and regulations made by this board in pursuance of this act, in regard to the inspection, disinfection and isolation of the same, upon its arrival at any port in the United States, and for the treatment of persons and cargo on board, so as to prevent the introduction of contagious diseases into the United States, and it shall be unlawful for any vessel to enter such port, to land its passengers, or discharge its cargo, except upon a certificate from the health officer of such port, that such rules and regulations have in all respects been complied with.

§ 6. In the event of any sudden emergency, threatening the importation of contagious or infectious disease into the United States from any foreign country, the President of the United States is hereby authorized and required, in his discretion, to adopt and make known forthwith, by public proclamation, such measures as may meet the emergency, either by suspending the introduction into the United States, by land or sea, of any specified merchandise calculated to be a vehicle for the communication of contagion, or by prohibiting the entry into the ports of the United States of vessels coming from infected countries or having contagious or infectious disease on board. And in case the President shall at any time exercise the authority hereby conferred upon him, he shall, at or before the time of issuing such proclamation as aforesaid, convene the National Board of Health, to meet at Washington in special session within ten days from the date of such notice of convention, and the said board shall thereupon advise such measures as it may deem sufficient to meet the emergency ; and upon the taking effect of such measures with the approval of the President of the United States as herein provided, the President's proclamation aforesaid shall cease to have effect. It shall be the duty of this board at all times to give prompt attention to any question in sanitary science which may be submitted to it by the President.

§ 7. It shall be the duty of the Department of State to obtain from the consular officers at foreign ports or places, all available information in regard to the sanitary condition of such ports and places, and to transmit the same to this board ; and it shall be the duty of this board to obtain from the State and municipal health authorities throughout the United States, and from all other available sources, weekly reports of the sanitary condition of ports and

places within the United States, and reports and other matters relating to climatic and other conditions affecting the public health, and it shall prepare, publish and transmit to State and other authorities, and other proper persons, weekly abstracts of such reports, consular reports, and other useful information relating to the public health; and it shall make to the President, for transmission to Congress, an annual report of its transactions, with such recommendations as it may deem important to the public health; and the necessary printing of the board shall be done at the Government printing office, upon the requisition of the secretary of such board, in the same manner and subject to the same provisions as other public printing for the several departments of the government.

§ 8. The President of the United States is authorized, when requested by this board, and when the same can be done without prejudice to the public service, to detail officers from the several departments of the government, for temporary duty, to act under the direction of this board in carrying out the provisions of this act, and such officers shall receive no additional compensation, except for actual and necessary expenses incurred in the performance of such duties.

§ 9. To meet the expenses incurred in carrying out the provisions of this act, the sum of five hundred thousand dollars, or so much thereof as may be necessary, is hereby appropriated, to be disbursed under the direction of the board; and the board shall have authority to appoint such disbursing agents as it deems necessary, who shall give bond as in other cases, for the faithful performance of their duties.

§ 10. All acts and parts of acts in conflict with any of the provisions of this act shall be, and are hereby, repealed.

NOTE.— This is the bill prepared by the National Conference of State Boards of Health.

VITAL STATISTICS.

REPORT.

The committee's work under this branch has been two-fold :

1. The investigation of outbreaks of disease ; and
2. The progress made in the registration of Vital Statistics.

Under the former head two investigations have been made, one of cholera asphyxia, the other of trichinosis. Reports on both of those will be found hereafter.

The beginning of the publication of a monthly bulletin of mortality was made for the month of April, and although necessarily incomplete, has been very popular, and is growing more accurate each issue.

A determined effort has been made to organize delinquent local boards and to bring up, by means of temporary assistance, the arrearages of the board's registration work. The experiment has proved satisfactory in every sense.

J. SAVAGE DELAVAN, M. D.,
Chairman.

ALBANY, August 26, 1884.

Dr. J. SAVAGE DELAVAN, *Chairman, etc.:*

DEAR SIR — Under instructions I visited yesterday the village of Hoosick Falls, on account of a so-called case of *cholera asphyxia*, for the purpose of inquiring into the nature of the case. The following facts I learned by inquiry of the health officer and other members of the village board of health, the undertaker, the attending physician, and by an inspection of the body of the deceased.

Patrick Hurley, aet. seventy-two, unmarried and by occupation a laborer, usually a healthy man, had been troubled with a moderate diarrhoea for several days of the hot weather of last week; he went to his work as usual, being employed in cleaning out a filthy brook running through the village. Thursday morning he worked; in the afternoon his diarrhoea became suddenly worse. Dr. J. C. Hannan was sent for, and being unable to attend at once, sent him, at six p. m., an appropriate remedy; at three a. m., he was again sent for and found him purging, vomiting, with feeble circulation, and severe cramps of the legs and arms. The discharges were watery, said to

be "rice water," in character copious, and at that time not at all feculent. There was some abdominal pain, but it was less than that of the extremities. The doctor gave ten drops of Magendie's solution hypodermically, and an hour later gave ten more, after which the pain was relieved as well as the vomiting and purging, the pupils being noted as dilated. Friction to the extremities was directed. At nine A. M. Friday he saw him again; the cramps of the extremities had returned, and he was much prostrated, the circulation being very inactive, the pulse weak and rapid. Electricity and alcohol hypodermically were used without result, and he died at one P. M., about twenty hours after onset; he was quite cyanotic before he died.

Dr. Hannan says he has known the man for years; that he has not been out of the village; was living with the family of his niece; was a steady working man.

He also says he has seen at remote points of the village and country three similar cases. Has seen cases of cholera in New York.

He did not note any special rigidity of the body before or after death; that there was none save of the extremities.

The undertaker saw the body at 1:30 and prepared it for burial. It was quite discolored, and later became mottled. At 3 P. M., Friday, there was rigidity of the limbs, such as to make putting on the clothes rather difficult. The body was still rigid on Saturday afternoon when put into the coffin, but was in no way distorted, as is often noted in the case of true cholera. Ice was not used. It was injected and washed with embalming fluid. At the funeral, which was public, the coffin was not opened and not more than a dozen persons came into the house.

The health officer states that attention was called to the case by the death certificate containing the already mentioned cause of death, and that this was not until Saturday night, being then presented for a burial permit. A quarantine was ordered and this board communicated with; their telegram failing, however, to reach this office until Monday afternoon.

In company with the health officer and clerk of the board, I went to the cemetery and inspected the body, which was yet in a vault. Dissection of the body was not made. It was still somewhat rigid, the flesh firm, there was no distortion, the skin was cold and not much discolored, except about the face, which was swollen and apparently cedematous as was also the rest of the body, a condition not to be looked for in a severe case of choleraic flux.

You will observe that there are some points in this case which are those of true cholera. The onset and course of the case was dissimilar, however, and it is not uncommon to find rice-water discharges and muscular cramps with final prostration attending severe cases of sporadic cholera or cholera morbus. On account of his age, the hot weather, his weakened condition from a few days of diarrhoea and most especially by the exposure to the filth of the stream he was working in, he induced the violent flux which caused

his death. The stream receives sewage and rubbish in great quantity, and is a vile open sewer running through the village. It has been peremptorily condemned by the local board and by this, and it seems difficult to believe that a handsome and prosperous village of 7,000 inhabitants should have neglected so long a sure source of disease. It was the principal cause of the sickness of this man, who was working in it and exposed to the full force of its emanations.

I would report then that the case is one of sporadic choleraic flux or cholera morbus, as it might, perhaps, in less technical language be termed.

Respectfully yours,
F. C. CURTIS.

REPORT OF TRICHINOSIS AT ARIETTA.

REPORT.

To the State Board of Health:

The committee on vital statistics respectfully submits the following report of its investigation into the outbreak of sickness at Arietta, occasioned by the eating of raw ham. On the 5th day of July the subject was formally referred to this Committee by the Central Office. Dr. Beach, the Board's inspector of the district, was at once commissioned by telegraph to make a thorough investigation of the causes of the outbreak and report to this committee. He was also instructed to obtain, if possible, portions of the ham which caused the sickness and to trace the history of the outbreak as far as practicable to its source.

The committee believing the matter to be of such importance to the public health of the people of the State as to merit it, pains were taken to secure a full scientific investigation. The result, will be found embodied in the subjoined reports from Dr. Eugene Beach on the medical history of the disease, and Prof. William Hailes, Jr., on the revelations of the microscope.

No doubt can be entertained of the correctness of the diagnoses made, and the lessons conveyed are plain and practical. They point first to the importance of impressing upon the minds of the people the danger of consuming uncooked or partially cooked ham or pork, and of making sure that such meat is entirely and perfectly cooked before eating; and second, to the necessity for more care in

selecting and preparing porcine flesh for the market. Statistics show that trichinous infection is not at all uncommon in the flesh of swine, that many hams and sides are infected therewith. In view of these facts when the trachinascope is an instrument which any butcher can use with ease, some legal enactment should be made to prevent the sale of trichinous meat, and some penalty imposed for the sale of an article so dangerous to the life and health of the people.

Respectfully submitted,

Committee, { J. SAVAGE DELAVAN, M. D., *Chairman*,
GEORGE W. COOKE, M. D.,
EDWARD M. MOORE, *President*,
ALFRED L. CARROLL, *Secretary*.

GLOVERSVILLE, N. Y., *July 14, 1884.*

MESSRS. CLARK & WOOD, Fort Plain :

There have been twelve cases of sickness in Arietta, Hamilton county, N. Y., resulting from eating raw ham ; two of the sick have died. There is no question as to the nature of the sickness, as the microscope has shown the muscles of one of the dead to be full of trichinæ.

By request of the State Board of Health, I am endeavoring to trace the ham which caused the sickness. Oliver Bonville, of Arietta, at whose table the ham was eaten, bought the ham, May 30, of L. E. Bradt of Garoga. Mr. Bradt bought the ham, April 3, of Clark & Wood of Fort Plain. He informs me that he got the ham from your smoke-house. In a conversation by telephone, on Friday last, with Mr. Clark, he told me he could not say whether it was State or western ham. The State Board of Health would like to know, if possible, if you have any means of stating positively regarding the matter, will you kindly inform me ?

Truly yours,

EUGENE BEACH

Dr. BEACH.

SIR—The ham came from Chicago, we think, in lot of 125 packages, bought of John Taylor, Trenton, N. J. Think the packer was Thorn & Co., Chicago. If can do any thing more for you let us know.

CLARK & WOOD.

MEDICAL REPORT.

TO J. SAVAGE DELAVAN, M. D., *Chairman of Committee* :

On the 2d of July, inst., Dr. J. E. Burdick, of Johnstown, stated to me that he had in charge several cases of fever of some kind at Arietta, a hamlet in Hamilton county, that there was some doubt regarding the nature of the sickness, and that the inhabitants of the place were quite alarmed regarding it. At the same time he requested that I should investigate the matter with as little delay as possible. Believing the case to be one meriting the immediate attention of the State Board of Health I visited Arietta on the 3d of July, inst., and reported the result of my observations to the secretary, and by your request have made some subsequent observations.

Following is an account of what I have done and found :

On my first visit I learned that there had been twelve cases of sickness more or less severe, and at that time one death. There has been one death subsequent to my first visit. The sickness showed the symptoms of trichinosis well marked. The persons sick had all eaten raw ham at about the same time* (June 5 to 7), and from the same ham. All who ate of the ham raw were more or less sick, and none who did not eat of the raw ham were sick. They were all taken sick at nearly the same time. They consisted of the family of Oliver Bonville and boarders in his family. All who had been sick enough to be attended by physicians had more or less fever, but no record had been kept, and they were visited only at intervals of two or three days. In some cases the temperature was found as high as 103 degrees Fahr. The prominent symptoms were diarrhoea and vomiting, fever, sweating, oedema, especially of the face, lameness and muscular soreness and sleeplessness in the adults. In the case of George Sumner, whom I saw about twelve hours before his death, there had been some circumscribed pneumonia apparently. There was hoarseness also in his case, and at the time of my visit his respirations were 39 per minute.

*Within a day or two, impossible to get exact dates in all cases.

Emma Jane Swan, aged 22, was taken sick June 8 with diarrhœa and vomiting, followed by fever. She was removed to her home at Newkirks, where she died June 25. She had œdema of the face. As she died before my visit I did not see her.

Oliver Bonville, aged 38, was taken sick June 9 with diarrhœa and vomiting, followed by fever. He had œdema of the face, lameness, sweating, and could not sleep. He was convalescing when I saw him July 3.

Paulina Bonville, wife of Oliver, aged 36, was taken sick June 8 with diarrhœa and vomiting, followed by fever. She had œdema of the face and extremities, sleeplessness, sweating, fornication, lameness and a vesicular eruption, and was still sick July 11.

Elizabeth Bonville, daughter of Oliver, aged 10, was taken sick June 8 with diarrhœa and vomiting. She had fever, sweating and œdema of eyes and was sore and lame. She could sleep. She left her bed July 1 and was convalescing.

Eugene Bonville, son of Oliver, aged 8, was taken sick June 8 with diarrhœa and vomiting, followed by fever. He had œdema of the face, sweating and lameness and was convalescing July 3. He could sleep.

George Sumner, aged 34, was taken sick June 8 with diarrhœa and vomiting. The diarrhœa continued during his sickness. The vomiting continued one week. He was sleepless, said he could not sleep. He sweat all the time. He had fever. His face was much swollen, especially about the eyes. He had some circumscribed pneumonia. He was hoarse, July 3, his pulse was 96, temperature 100 degrees Fahr., and respirations 39. He died on the morning of July 4.

Joseph Barney ate sparingly of the same ham, and was not sick nor quite well; he was somewhat lame and sore but kept around.

John Marshall ate of the same ham, at the same time, but had read about trichinæ and ate but little; he was attacked much the same as the others, but got better and went to his work in the woods; he was not quite well, but complained of lameness; he called upon me July 12, in my office, and still had diarrhœa and lameness.

Peter Mayhew, aged 28, was taken sick June 8, with diarrhœa and vomiting, followed by fever; diarrhœa continued two weeks; he had œdema of face and extremities, and great sweating; he could not sleep well; his lameness was not marked; July 11, his pulse was 96 and his temperature was 100 degrees Fahr.

John Burton, aged 29, was taken sick June 8, but went to his work in the woods, and stayed a week; he had a slight chill and was somewhat nauseated; he had diarrhœa but not much sweating; he had fever; he could sleep fairly; he had œdema of face and extremities, and lameness with some itching; he was convalescing July 3.

John Gilbo, aged 24, was taken sick June 8 with diarrhœa without vomiting; his symptoms were, in addition to the diarrhœa, sweating, sleeplessness, œdema of the face and extremities, and notable lameness; he was convalescing July 3.

D. J. Lyons called upon me July 11; he ate of the same ham, raw, at the same time with the others; he had diarrhœa two or three days afterward, and has not been well since then; he has felt dull and lame, and has had twitching of the muscles.

George Sumner died July 4 and was buried July 5. Although the facts already known pointed so unmistakably to trichinosis as the disease from which these sick persons had been suffering, I thought it wise to demonstrate the actual presence of trichinæ. In pursuance of this object, on the 7th of July, accompanied by Dr. J. E. Burdick and Dr. P. R. Furbeck, I disinterred Sumner's body and secured portions of the flexor muscles of the arm and leg which I placed in your possession on July 8. These gave abundant evidence of the presence of trichinæ.

By your direction, I have also made an effort to ascertain the source from which the ham which caused this sickness was obtained. Mr. Bonville bought the ham on the 30th of May last of L. E. Bradt, in Garoga. Mr. Bradt bought the ham of Clark & Wood, in Fort Plain. The bill is dated April 3, 1884. I inclose correspondence had with Clark & Wood, which shows that the ham came from Chicago; that it was bought of John Taylor, Trenton, N. J., and was packed by Thorn & Co., Chicago.

Respectfully submitted,

EUGENE BEACH.

REPORT OF MICROSCOPIST.

ALBANY, July 12, 1884.

Dr. J. SAVAGE DELAVAN, *Chairman of Committee on Vital Statistics:*

DEAR SIR — I find upon microscopic examination of portions of human muscle recently received from Dr. E. G. Beach, of Gloversville, N. Y., that trichinæ exist in great abundance (twenty-seven in a single field — about 3,000 to the cubic inch).

Some of the worms observed were already inclosed with a transparent cyst, while many were only partially rolled up or coiled upon themselves, others were free in the tissues. The muscular tissue examined was from the extremities.

From the above facts we are justified in concluding that it is an unmistakable case of marked trichinosis of recent origin.

FRESH TRICHINOUS INVASION.



(Explanation of figure.)

Portion of a field showing encysted face coiled and uncoiled trichinæ. Specimens from the Arietta case.

The following is a brief resume of a few well-known scientific facts concerning trichinæ:

When infested meat is taken into the stomach in a raw or partially cooked condition, the cysts which surround the trichinæ in its adult state are removed by digestion and the worms set free. They increase in size and on the second day the male and female reaches their full sexual maturity; six days after maturity the females produce from 1,000 to 1,500, or more, living filamentous embryos.

The young immediately begin to wander and invade the surrounding tissues; they pierce the intestinal walls and finally reach the voluntary muscles of their host, growing larger and absorbing the vital juices from the tissues through which they pass. They are found in greatest abundance at the insertion of the muscles with the tendons, where they roll themselves up and become encysted, at first transparent and difficult to see, but later presenting a whitish appearance, in consequence of a deposition of calcareous matter, etc., about the cyst, which renders them visible to the naked eye. They remain viable for many years.

PREVENTION OF TRICHINOSIS.

1. Meat should not be eaten raw or in a partially cooked condition.

2. Thorough cooking is a perfectly efficient means of killing trichinae. Large masses of meat (such as a ham), however, require several hours continuous cooking, for the heat to penetrate throughout the entire mass. A medium sized ham boiled for thirty minutes reaches a temperature of a little above 100 degrees Fahr. It requires 140 degrees Fahr. to positively kill the parasite. In the case of chops, steaks and other small portions, a much shorter time will suffice. A thorough broil of a few minutes will effectually destroy the life of the trichinae. Ordinary salting and smoking does not destroy the parasite.

3. Thorough inspection of the meat. A regular examination should be made by the State. The matter is easily accomplished. The parts required for a perfectly satisfactory examination are two small fleshy masses situated near the kidneys, called the pillars of the diaphragm. These pieces belong to the "trimmings" and their removal in no way interferes with the value or appearance of the dressed hog.

"All hogs should be subjected to microscopic examination by experts, and no hog allowed to be cut up for sale as food until such an examination had been made. Those found invaded should be branded trichinous and their sale as food forbidden by law under penalty of a heavy fine."—Billings.

A certificate could be given if examination proved satisfactory.

4. Prevent hogs from feeding upon raw offal and excrement and avoid using the offal, etc., of animals subject to trichinosis as a fertilizer.

5. The thorough destruction of all offal, excrement, etc., so that vermin (rats, etc.) may not devour it and become the carriers of this dread malady.

Rigid legislative enactment regulating the inspection of meat, the proper disposal of offal, excrement, etc., etc., would, if properly enforced, go far toward stamping out this loathsome disease.

Very respectfully,

WILLIAM HAILES,

Pathological Laboratory, Albany Medical College.

TO DR. J. SAVAGE DELAVAN, *Chairman* :

The publication of a monthly bulletin of the mortality of the State was begun in April. It was not deemed expedient to publish every one of the several hundred towns, villages and cities reporting; instead, the State was divided into eight districts, known as the Maritime, the Hudson Valley, the Adirondack and Northern, the Mohawk Valley, the Southern Tier, the East Central, the West Central and the Lake Ontario and Western. These districts include the following counties, respectively: The *Maritime*: Includes New York, Long Island, Staten Island and Westchester county. *Hudson Valley*: All the counties on either side of the Hudson river, to and including Albany and Rensselaer. *Adirondack and Northern*: The northern section of the State—the counties of Washington, Warren, Hamilton, Essex, Clinton, Franklin, St. Lawrence, Jefferson and Lewis. *Mohawk Valley*: Schenectady, Schoharie, Saratoga, Montgomery, Fulton, Herkimer and Oneida counties. *Southern Tier*: The seven counties along the southern boundary. *East Central*: Sullivan, Delaware, Otsego, Madison, Chenango, Onondaga and Cortland counties. *West Central*: Cayuga, Tompkins, Seneca, Schuyler, Ontario, Yates, Livingston, Genesee and Wyoming counties. *Lake Ontario and Western*: Oswego, Wayne, Monroe, Orleans, Niagara and Erie counties.

The principal towns, villages and cities in each district are individually given in the bulletin, the remainder being summed together as the *rest of the district*. Places of less than 3,000 population are not reported separately. The cities are distinguished by being printed in small capitals, the villages by italics, and the towns by common or roman type. The populations are some of them estimated to the present date, and these are distinguished by being printed in heavy-faced figures; smaller figures are used for populations taken from the census of 1880. More accuracy and uniformity respecting the population can be secured after the census of this year.

The report during this year has included all of the twenty-four cities of the State except Buffalo and Watertown, the latter having also since begun to make returns. There has been steadily an improvement in the fullness of the reports since the publication was begun, both as to the number of the places reporting and as to the faithfulness of their returns.

A very considerable number of important villages and towns have as yet failed to be stimulated to report to the central board upon their mortality, or to send in their certificates of births, deaths and marriages. It has also been found by means of the bulletin that many places are derelict in the securing of complete returns. Besides, no provision has been made in the bulletin for taking account of returns that have been received too late for publication, although all have been required to send their certificates and reports by the 15th of the month following the month reported

upon. Still the entire number of deaths reported in the nine bulletins issued during the year is 56,465, or an average monthly mortality of 6,275. This is probably within 1,800 of the actual mortality of the State.

The deaths have been classified under twenty different diseases and groups of diseases. Most of the zymotic diseases are specified separately. The proportion of these to the total mortality will hereafter be given for each locality.

While still necessarily imperfect, improvement is noted in the successive issues, and a somewhat satisfactory purview of the state of health and movement of diseases over the State is, with due allowances, obtained. The publication is, however, even more effective in informing the Central Board of the state of work by local boards, and stimulating them generally to more effective service.

F. C. CURTIS.

The following are copies of the issues of the Bulletin from its publication for April, 1884, to the end of the year

[Sen. Doc. No. 47.] 17

MONTHLY BULLETIN OF THE NEW YORK STATE BOARD OF HEALTH.

Abstract of reports of deaths and their causes in the following districts, cities and towns, during April, 1884.

	Population.	Total number of deaths.	Representing annual death rate per 1,000 of —	Deaths under five years.	Percentage of deaths under five years to total deaths.	Cerebro-spinal fever.	Typhus fever.	Typhoid fever.	Malarial diseases.	Small-pox.	Scarlet fever.	Measles.	Erysipelas.	Whooping-cough.	Croup and diphtheria.	Acute respiratory diseases.	Consumption.	Puerperal diseases.	Diarrheal diseases.	Diseases of digestive system (not diarrheal).	Diseases of urinary system.	Diseases of circulatory system.	Diseases of nervous system.	Cancer.	Accidents and violence.	Old age.	Unclassified.	
MARITIME DISTRICT:																												
New York city.....	1,356,958	2,719	23.96	1,055	42.8	14	0	10	21	0	63	39	18	32	147	0	417	36	50	0	0	0	0	0	0	0	0	1,562
Brooklyn.....	634,526	1,056	19.66	383	34.3	0	0	3	13	0	27	9	8	9	42	185	174	21	10	51	0	66	77	138	0	37	13	159
Long Island City.....	21,000	27	15.43	8	29.6	1	0	0	5	0	0	0	1	1	4	2	3	3	0	0	2	0	0	0	0	0	1	0
New Lots.....	17,000	21	14.83	10	47.6	4	0	0	1	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	1	0
Newtown.....	9,798	21	25.72	5	20.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Yonkers.....	22,000	24	13.69	5	20.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Ossining.....	8,760	10	13.69	5	20.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Rest of district.....	.....	68	.....	.....	.....	0	0	0	2	0	0	0	0	1	17	0	18	0	1	6	0	0	13	1	2	4	0	5
HUDSON VALLEY DISTRICT:																												
Newburgh.....	20,000	33	19.95	16	48.5	0	0	0	1	0	1	0	0	0	1	3	5	1	0	2	0	0	4	0	0	1	3	9
Goshen.....	4,387	7	19.16	.....	.....	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Port Jervis.....	8,000	11	16.5	3	27.3	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Walkill.....	11,483	16	16.72	.....	.....	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Fishkill.....	10,732	11	12.29	.....	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poughkeepsie.....	20,207	30	17.81	.....	.....	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Kingston.....	20,000	18	10.80	4	22.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saugerties.....	10,375	4	4.8	.....	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hudson.....	10,000	15	18	5	33.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Albany.....	97,344	210	25.88	.....	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cohoes.....	20,000	36	30.5	16	44.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Watervliet.....	22,220	23	21.6	.....	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Troy.....	60,000	33	6.6	12	36.3	0	0	0	4	0	3	1	0	2	10	46	44	3	1	16	8	30	40	10	5	21	13	
Rest of district.....	.....	261	.....	.....	.....	0	0	0	4	0	3	1	0	2	10	46	44	3	1	16	8	30	40	10	5	21	13	

MONTHLY BULLETIN OF THE NEW YORK STATE BOARD OF HEALTH.

Abstract of reports of deaths and their causes in the following districts, cities and towns, during May, 1884.

	Population.	Total number of deaths.	Representing annual death-rate per 1,000 of—	Deaths under five years.	Percentage of deaths under five years to total deaths.	Cerebro-spinal fever.	Typhus fever.	Typhoid fever.	Malarial diseases.	Small-pox.	Scarlet fever.	Measles.	Erysipelas.	Whooping cough.	Croup and diphtheria.	Acute respiratory diseases.	Consumption.	Puerperal diseases.	Diarrhoeal diseases.	Diseases of digestive system (not diarrhoeal).	Diseases of urinary system.	Diseases of circulatory system.	Diseases of nervous system.	Cancer.	Accidents and violence.	Old age.	Unclassified.	
MARITIME DISTRICT :																												
New York city	1,356,958	2,751	24.41	1,047	37.9	13	0	16	31	0	68	93	25	44	145	393	433	42	84	142	205	*	187	233	0	136	54	318
Brooklyn	644,526	997	18	332	34.3	0	0	5	19	0	37	5	7	19	37	137	157	17	21	41	47	62	114	0	36	22	184	
New Lots	17,000	31	21.49	11	35.5	0	0	0	0	0	0	0	0	0	0	2	4	0	0	2	5	0	0	0	0	0	1	7
New Utrecht	4,742	7	17.71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Long Island City	21,000	48	27.33	26	54.2	0	0	1	0	0	2	0	0	0	6	0	6	8	0	0	5	10	0	0	0	0	0	0
Newtown	10,000	16	19.20	6	36.2	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0
Oyster Bay	12,000	8	8	2	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hempstead	13,160	12	8.05	6	50	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
North Hempstead	8,000	6	7.20	3	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jamaica	10,089	6	9.98	3	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonahold	7,257	6	9.45	3	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southampton	6,352	5	24	2	14.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northfield	7,014	14	12.55	5	21.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yonkers	22,000	23	17.14	1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Westchester	6,990	10	17.39	5	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mount Pleasant	8,450	4	5.68	2	22.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rye	7,500	9	14.4	0	14.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sing Sing	6,500	7	12.92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rest of district .....	.....	20	.....	9	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HUDSON VALLEY DISTRICT :																												
Albany	97,344	169	20.83	54	31.9	1	0	3	1	0	6	0	0	8	8	20	29	2	3	9	8	0	12	10	0	7	3	39
Cohoes	20,000	28	16.8	7	35	0	0	0	0	0	0	0	0	0	6	5	6	0	0	0	0	0	0	0	0	0	0	0
Argyle	3,700	4	12.97	0	16.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Watford	4,325	12	33.29	2	28.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Milton	5,565	5	10.78	4	28.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hoosick Falls	4,000	14	42	4	14.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Troy	60,000	128	5.6	4	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lansingburgh	7,764	25	38.68	6	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MONTHLY BULLETIN OF THE NEW YORK STATE BOARD OF HEALTH — (Continued).

	Population.	Total number of deaths.	Representing annual death-rate per 1,000 of—	Deaths under five years.	Percentage of deaths under five years to total deaths.	Cerebro-spinal fever.	Typhus fever.	Typhoid fever.	Malarial diseases.	Small-pox.	Scarlet fever.	Measles.	Rhyssipelas.	Whooping cough.	Croup and diphtheria.	Acute respiratory diseases.	Consumption.	Puerperal diseases.	Diarrhoeal diseases.	Diseases of digestive system (not diarrhoeal).	Diseases of urinary system.	Diseases of circulatory system.	Diseases of nervous system.	Cancer.	Accidents and violence.	Old age.	Unclassified.
EAST CENTRAL DISTRICT:																											
Delhi	2,941	4	16	1	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Cooperstown	3,900	7	28	2	28.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Oneonta	3,000	5	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Morris	2,400	4	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Worcester	3,000	7	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Milford	2,467	4	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Brookfield	3,653	5	16.28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Norwich	3,753	14	29.16	2	14.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Covington	2,317	4	36.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Guilford	5,770	86	18.5	27	31.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Syracuse	51,700	4	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Lysander	2,000	4	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Homer	3,300	4	13.71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Rest of district .....	.....	94	.....	14	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
WEST CENTRAL DISTRICT:																											
Auburn	26,000	37	17	6	16.2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Schoharie	2,093	3	17.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Genee	2,517	3	10.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Itasca	11,198	7	7.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Watrous	4,500	8	21.33	2	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Junius	1,356	3	26.55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manchester	4,000	7	21	1	14.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pheips	7,000	6	8.57	1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bristol	1,650	3	21.81	1	33.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geneva	6,000	9	18	1	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Naples	2,700	4	17.77	2	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Victor	2,804	3	12.85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perry	2,500	3	8.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rest of district .....	.....	37	14.4	4	10.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MONTHLY BULLETIN OF THE NEW YORK STATE BOARD OF HEALTH.

Abstract of reports of deaths and their causes in the following districts, cities and towns, during June, 1884.

Population.	Total number of deaths.	Representing annual death-rate per 1,000 of—	Deaths under five years	Percentage of deaths under five years to total deaths.	Cerebro-spinal fever.	Typhus fever.	Typhoid fever.	Malarial diseases.	Small-pox.	Scarlet fever.	Measles.	Erysipelas.	Whooping cough.	Croup and diphtheria.	Acute respiratory diseases.	Consumption.	Puerperal diseases.	Diarrhœal diseases.	Diseases of digestive system (not diarrhœal)	Diseases of urinary system.	Diseases of circulatory system.	Diseases of nervous system.	Cancer.	Accidents and violence.	Old age.	Unclassified.
MARITIME DISTRICT :																										
1,336,958	2,955	26.12	1,437	48.6	17	0	18	23	0	54	117	14	28	136	270	416	35	426	164	177	139	283	60	142	171	165
New York city	605	55	0	0	4	17	0	21	10	6	19	82	123	161	20	290	85	144	58	112	0	40	20	442
Brooklyn	20.47	12	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cohoes	21.18	3	42.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Lots	17.00	12	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Utrecht	4.742	7	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flatlands	17.71	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flatbush	3.127	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Newtown	15.35	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Newtown	21.2	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oyster Bay	4	2	50	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hempstead	5.28	4	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Hempstead	11.56	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southold	8.207	1	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southampton	6.352	2	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Greenport	18.89	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northfield	17.25	2	9.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Westfield	13.61	1	33.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yonkers	54.5	12	54.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yonkers	6.96	1	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Westchester	17.61	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mount Pleasant,	6.4	1	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yonkers	7.500	4	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sing Sing	13.46	1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rest of district	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HUDSON VALLEY DISTRICT :																										
97,344	152	18.75	53	34.8	0	0	2	0	0	6	1	1	7	5	7	27	0	18	7	7	9	18	0	4	3	27
Albany	7	77.7	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0
Cohoes	3.40	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green Island	19.20	4	28.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hoosick	21	4	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hoosick	6.80	14	41.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Troy	34	14	28.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lansingburgh	22.92	4	.....	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[illegible]

MONTHLY BULLETIN OF THE NEW YORK STATE BOARD OF HEALTH — (Continued).

	Population.	Total number of deaths.	Representing annual death-rate per 1,000 of—	Deaths under five years.	Percentage of deaths under five years to total deaths.	Cerebro-spinal fever.	Typhus fever.	Typhoid fever.	Malarial diseases.	Small-pox.	Scarlet fever.	Measles.	Erysipelas.	Whooping cough.	Croup and diphtheria.	Acute respiratory diseases.	Consumption.	Puerperal diseases.	Diarrhœal diseases.	Diseases of digestive system (not diarrhœal).	Diseases of urinary system.	Diseases of circulatory system.	Diseases of nervous system.	Cancer.	Accidents and violence.	Old age.	Unclassified.
EAST CENTRAL DISTRICT:																											
Walton.....	8,544	4	13.54	1	25.0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Coopersdown.....	3,000	2	8	0	16.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oneonta.....	5,000	6	14.40	1	16.6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Morris.....	2,400	2	10	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Worcester.....	3,000	2	8	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Owego.....	1,918	5	31.23	1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Norwich.....	6,755	8	17.20	1	12.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guilford.....	2,500	4	19.5	0	19.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Syracuse.....	51,791	81	18.76	25	32.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geddes.....	7,086	4	6.77	0	6.77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tully.....	1,476	9	32.52	0	32.52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Homer.....	3,500	9	30.85	0	30.85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rest of district.....	.....	39	.....	4	10.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WEST CENTRAL DISTRICT:																											
Auburn.....	26,000	19	8.77	7	36.8	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scipio.....	2,093	5	28.09	1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Genoa.....	2,517	2	9.53	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ilwaco.....	11,198	2	8.57	1	12.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hector.....	5,025	2	4.80	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Watertown.....	4,500	7	18.88	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Seneca Falls.....	6,853	8	14	0	16.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manchester.....	4,000	6	18	0	33.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phelps.....	7,000	1	1.71	0	16.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bristol.....	1,650	3	21.81	0	33.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geneva.....	6,000	8	16	0	16.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fayette.....	3,316	2	7.24	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Victor.....	2,804	3	17.12	2	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Attica.....	3,099	3	11.61	0	8.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rest of district.....	.....	49	.....	4	8.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MONTHLY BULLETIN OF THE NEW YORK STATE BOARD OF HEALTH.

Abstracts of reports of deaths and their causes in the following districts, cities and towns, during July, 1884.

	Population.	Total number of deaths.	Representing annual death-rate per 1,000 of—	Deaths under five years.	Percentage of deaths under five years to total deaths.	Cerebro-spinal fever.	Typhus fever.	Typhoid fever.	Malarial diseases.	Small-pox.	Scarlet fever.	Measles.	Erysipelas.	Whooping cough.	Group and diphtheria.	Acute respiratory diseases.	Consumption.	Puerperal diseases.	Diarrheal diseases.	Diseases of digestive system (not diarrheal).	Diseases of urinary system.	Diseases of circulatory system.	Diseases of nervous system.	Cancer.	Accidents and violence.	Old age.	Unclassified.
MARITIME DISTRICT:																											
New York City.....	1,356,958	8,859	30.53	2,276	58.9	14	6	25	37	0	48	124	12	50	100	246	406	29	1245	273	205	137	250	60	105	189	294
Brooklyn.....	644,526	1,646	30.64	983	59.7	0	0	47	26	0	10	15	2	41	80	90	150	16	689	6	85	54	112	1	43	26	211
New Lots.....	17,000	50	35.29	29	58.0	0	0	0	0	0	0	0	0	1	0	0	3	0	5	0	0	0	1	0	0	0	7
New Utrecht.....	4,742	12	30.37	7	58.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4
Flatlands.....	3,127	9	34.54	6	66.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Newtown.....	10,000	22	26.40	15	68.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Oyster Bay.....	12,000	14	14.00	7	59.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hempstead.....	18,160	8	5.22	4	50.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Hempstead.....	8,000	13	19.50	7	53.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southold.....	7,267	3	4.96	1	33.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southampton.....	6,352	10	18.87	1	10.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northtown.....	10,000	26	31.20	11	52.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northfield.....	7,000	13	30.00	11	61.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Westfield.....	7,256	9	20.42	4	64.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yonkers.....	22,000	47	25.64	24	69.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Westchester.....	8,900	9	15.63	5	55.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Westchester.....	8,450	6	8.52	3	35.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mount Pleasant.....	7,500	7	11.20	4	28.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sing Sing.....	6,500	13	24.00	6	69.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rest of District.....	.....	40	.....	20	50.0	0	0	0	0	0	0	0	0	0	1	5	9	0	7	2	1	1	4	0	0	0	0
HUDSON VALLEY DISTRICT:																											
Albany.....	97,344	203	25.02	94	46.3	9	0	2	0	0	4	0	0	4	4	9	30	1	60	18	3	25	12	0	5	4	11
Cohoes.....	20,000	16	9.60	11	68.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
West Troy.....	13,000	42	38.77	21	60.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green Island.....	5,000	15	36.00	9	50.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bath-on-the-Hudson.....	5,000	6	14.40	3	50.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hoosick Falls.....	7,000	11	18.88	5	45.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MONTHLY BULLETIN OF THE NEW YORK STATE BOARD OF HEALTH — (Continued).

	Population.	Total number of deaths.	Representing annual death-rate per 1,000 of —	Deaths under five years.	Percentage of deaths under five years to total deaths.	Cerebro-spinal fever.	Typhus fever.	Typhoid fever.	Malarial diseases.	Small-pox.	Scarlet fever.	Measles.	Erysipelas.	Whooping cough.	Croup and diphtheria.	Acute respiratory diseases.	Consumption.	Puerperal diseases.	Diarrheal diseases.	Diseases of digestive system (not diarrheal).	Diseases of urinary system.	Diseases of circulatory system.	Diseases of nervous system.	Cancer.	Accidents and violence.	Old age.	Unclassified.
SOUTHERN TIER DISTRICT :																											
Olean.....	5,000	7	16.80	2	25.6	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	1
Horseheads.....	3,500	2	6.86	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Newark Valley.....	2,597	4	18.62	1	25.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rest of District.....	.....	10	.....	1	10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EAST CENTRAL DISTRICT :																											
Delhi.....	2,941	6	26.00	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Walton.....	3,541	7	23.70	1	11.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cooperstown.....	3,000	8	32.00	0	25.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oneonta.....	5,000	5	12.00	0	40.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Morris.....	5,000	5	20.00	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Worcester.....	3,665	3	12.60	0	33.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brookfield.....	3,383	2	9.75	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cazenovia.....	5,755	7	11.12	0	17.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saratoga.....	63,000	118	21.75	29	17.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schuyler.....	7,086	9	15.42	3	33.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hughes.....	3,500	7	24.00	0	14.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rest of District.....	.....	62	.....	0	12.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WEST CENTRAL DISTRICT :																											
Auburn.....	26,000	30	18.00	5	12.8	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scipio.....	2,003	2	11.13	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Genoa.....	2,517	1	4.77	1	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ithaca.....	11,198	9	9.64	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Watertown.....	4,500	4	10.66	1	25.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Seneca Falls.....	6,853	4	7.00	0	16.6	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manchester.....	4,000	6	18.00	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phelps.....	7,000	2	3.43	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geneva.....	6,000	9	18.00	1	12.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lima.....	2,800	4	17.14	2	50.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Attica.....	3,009	7	27.09	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rest of District.....	.....	42	.....	1	2.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[illegible]

REMARKS.—The number of deaths reported during the month is 7,627. Infant mortality is largely increased, the proportion being 33.4 for the State; the increase has fallen at most entirely on the city population. From diarrhical diseases, which represent most of this increase, the percentage of deaths is 30.3; in June it was 13.68; in May, 2.29; in April, 60 per cent of the entire mortality.

MONTHLY BULLETIN OF THE NEW YORK STATE BOARD OF HEALTH.

Abstract of reports of deaths and their causes in the following districts, cities and towns, during August, 1884.

Population.	Total number of deaths.	Representing annual death-rate per 1,000 of—	Deaths under five years.	Percentage of deaths under five years to total deaths.	Cerebro-spinal fever.	Typhus fever.	Typhoid fever.	Malarial diseases.	Small-pox.	Scarlet fever.	Measles.	Erysipelas.	Whooping cough.	Croup and diphtheria.	Acute respiratory diseases.	Consumption.	Puerperal diseases.	Diarrhoeal diseases.	Diseases of digestive system (not diarrhoeal).	Diseases of urinary system.	Diseases of circulatory system.	Cancer.	Accidents and violence.	Old age.	Unclassified.		
MARINE DISTRICT:																											
New York city.....	1,356,958	27.11	1,637	52.6	15	0	49	44	0	21	57	11	55	109	228	419	24	730	197	143	101	275	0	103	173	397	
Brooklyn.....	611,336	25.46	1,714	53.3	0	0	10	22	0	9	8	0	35	31	92	150	13	397	79	44	47	13	0	32	28	232	
New Lots.....	17,000	25.41	25	69.4	0	0	0	1	0	0	0	0	0	0	0	0	0	1	13	1	3	0	0	0	0	9	
New Utrecht.....	4,712	40.42	4	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Flatlands.....	3,127	26.84	6	85.5	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
Long Island City.....	21,000	34.29	36	60	0	0	1	2	0	0	0	0	0	0	0	1	0	5	0	3	2	4	1	3	0	0	
Newtown.....	10,000	18	8	44.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Oyster Bay.....	12,000	17	6	35.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hempstead.....	18,150	17	6	35.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
North Hempstead.....	8,000	13.5	4	44.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sag Harbor.....	.....	.....	4	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southern.....	7,257	11	2	18.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Southampton.....	6,332	2	1	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Middletown.....	10,000	33	12	37.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Northfield.....	7,011	7	2	28.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Westfield.....	5,259	12	7	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yonkers.....	22,000	22	12	46.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Mount Pleasant.....	8,450	11	2	18.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Rye.....	7,500	3.6	2	33.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sing Sing.....	6,500	11	20.31	18.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Rest of district.....	.....	.....	7	35	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MUDSON VALLEY DISTRICT:																											
Albany.....	97,311	18.12	54	36.7	0	0	7	0	0	0	0	1	4	1	10	19	0	17	7	4	13	9	0	1	5	42	
Cohoes.....	20,000	17.2	8	.....	0	0	0	0	0	0	0	0	1	1	0	2	0	0	3	1	0	0	1	1	0	0
West Troy.....	13,600	18.48	7	33	0	0	2	0	0	0	0	0	1	1	2	4	0	0	3	1	1	0	0	0	0	0	
Green Island.....	3,000	28.5	5	41.6	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	
Hoosick Falls.....	11,111	12	4	28.3	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
Troy.....	60,000	17.6	40	45.3	0	0	1	0	0	1	0	0	2	0	11	11	1	20	2	2	12	0	1	0	0	0	

MONTHLY BULLETIN OF THE NEW YORK STATE BOARD OF HEALTH — (Continued).

	Population.	Total number of deaths.	Representing annual death-rate per 1,000 of—	Deaths under five years.	Percentage of deaths under five years to total deaths.	Cerebro-spinal fever.	Typhus fever.	Typhoid fever.	Malarial diseases.	Small-pox.	Scarlet fever.	Measles.	Krysiplas.	Whooping cough.	Croup and diphtheria.	Acute respiratory diseases.	Consumption.	Puerperal diseases.	Diarrheal diseases.	Diseases of digestive system (not diarrheal).	Diseases of urinary system.	Diseases of circulatory system.	Diseases of nervous system.	Cancer.	Accidents and violence.	Old age.	Unclassified.
SOUTHERN TIER DISTRICT:																											
Bath.....	7,394	9	14.59	2	22.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1
Jamestown.....	12,000	13	33.66	0	36.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0
Westfield.....	3,360	12	30.39	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Oran.....	5,000	12	28.8	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Rest of district.....		14	.....	8	21.5	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4
EAST CENTRAL DISTRICT:																											
Delhi.....	3,000	7	28	0	15.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Watlet.....	3,541	13	44.06	2	15.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Franklin.....	3,000	3	12	0	66.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oran.....	5,000	9	21.3	5	55.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Worcester.....	3,000	7	28	1	14.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brookfield.....	3,685	3	9.78	1	33.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Norwich.....	5,500	11	24	3	27.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Syracuse.....	65,000	96	17.72	33	39.6	2	0	1	0	0	0	0	0	2	5	3	6	9	1	24	7	0	0	0	6	0	0
Geddes.....	7,085	5	8.56	2	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Homer.....	3,500	5	17.14	2	32.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rest of district.....		58	.....	19	40	0	0	1	0	0	0	0	0	0	3	2	5	0	1	12	4	4	0	0	0	0	2
WEST CENTRAL DISTRICT:																											
Auburn.....	26,000	52	24	23	43.8	0	0	0	2	0	0	0	0	0	0	0	0	0	0	19	5	0	0	0	1	0	5
Groton.....	3,450	5	17.39	1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ithaca.....	11,198	5	5.41	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Waterville.....	4,500	4	10.56	1	23.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Seneca Falls.....	6,853	9	14	2	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manchester.....	4,000	5	12	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phelps.....	7,000	4	6.86	1	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geneva.....	6,000	7	14	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lima.....	2,800	3	8.57	0	15.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rest of district.....		53	.....	8	15.1	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4

MONTHLY BULLETIN OF THE NEW YORK STATE BOARD OF HEALTH.

Abstract of reports of deaths and their causes in the following districts, cities and towns, during September, 1884.

	Population.	Total number of deaths.	Representing annual death-rate per 1,000 of—	Deaths under five years.	Percentage of deaths under five years to total deaths.	Cerebro-spinal fever.	Typhus fever.	Typhoid fever.	Malarial diseases.	Small-pox.	Scarlet fever.	Measles.	Erysipelas.	Whooping cough.	Croup and diphtheria.	Acute respiratory diseases.	Consumption.	Puerperal diseases.	Diarrhœal diseases.	Diseases of digestive system (not diarrhœal).	Diseases of urinary system.	Diseases of circulatory system.	Diseases of nervous system.	Cancer.	Accidents and violence.	Old age.	Unclassified.	
MARITIME DISTRICT:																												
New York city.....	1,356,958	2,680	26.45	1,369	40.9	15	0	62	34	0	25	36	7	72	97	231	397	25	19	190	166	101	297	0	131	175	376	
Brooklyn.....	644,526	1,363	25.19	703	52.1	0	0	19	33	0	3	2	1	31	57	89	154	15	339	86	43	84	168	1	46	23	232	
New Lots.....	17,069	49	34.59	32	63.3	0	0	0	4	0	0	0	0	0	0	2	3	0	10	1	1	9	1	1	0	0	7	
New Utrecht.....	4,742	9	22.78	2	22.2	0	0	0	1	0	0	0	0	0	0	0	0	0	10	1	1	7	1	0	0	0	1	
Long Island City.....	21,000	52	23.62	46	88.5	0	0	0	2	0	1	0	0	5	4	0	0	0	10	1	1	7	1	0	0	0	1	
Newtown.....	12,000	27	22.4	3	31.3	0	0	1	2	0	0	0	0	0	0	0	0	0	4	1	1	1	0	0	0	0	1	
Oyster Bay.....	16	16	100	4	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hempstead.....	18,160	3	16.5	11	61.1	0	0	0	0	0	0	0	0	0	0	1	1	1	6	1	1	1	0	0	0	0	0	
North Hempstead.....	8,000	21	26.3	11	37.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	
Sag Harbor.....	3,000	3	100	2	66.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
San Jacinto.....	10,089	12	11.36	4	33.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Southold.....	7,267	5	6.83	2	27.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Southampton.....	6,352	12	18.88	4	33.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Northfield.....	7,014	12	17.11	6	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Westfield.....	5,289	12	22.67	5	41.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Westport.....	22,000	31	14.09	11	50	0	0	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	
Yonkers.....	6,900	15	21.7	7	55.6	0	0	0	0	0	0	0	0	0	0	0	3	3	0	1	0	0	0	0	0	0	0	
Westchester.....	7,500	12	16	3	40	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	
Rye.....	6,500	15	23.08	5	33.3	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	
Sing Sing.....	.....	42	27.69	15	37.5	0	0	0	0	0	0	0	0	0	0	0	3	3	0	11	0	0	2	0	0	0	0
Rest of district.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
HUDSON VALLEY DISTRICT:																												
Albany.....	97,341	153	15.56	50	32.7	0	0	8	2	0	1	0	0	0	2	5	26	1	23	8	4	7	19	0	6	2	39	
Coboes.....	20,000	15	9	10	66.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
West Troy.....	13,000	25	19	12	46.1	0	0	3	0	0	1	0	0	0	0	3	3	0	5	2	1	4	4	0	2	0	3	
Hosick Falls.....	6,500	10	18.46	5	77	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	2	0	0	0	0	
Troy.....	60,000	130	21.67	46	35.4	0	0	7	0	0	0	0	0	1	0	4	2	0	25	6	15	26	22	0	4	1	4	
Lansingburgh.....	8,500	22	25.88	8	36.3	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	1	1	0	0	0	0	

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MONTHLY BULLETIN OF THE NEW YORK STATE BOARD OF HEALTH.

Abstracts of reports of deaths and their causes in the following districts, cities and towns, during October, 1884.

	Population.	Total number of deaths.	Rate per 1,000 of —	Deaths under five years.	Percentage of deaths under five years to total deaths.	Cerebro-spinal fever.	Typhus fever.	Typhoid fever.	Malarial diseases.	Small-pox.	Scarlet fever.	Measles.	Erysipelas.	Whooping cough.	Croup and diphtheria.	Acute respiratory diseases.	Consumption.	Puerperal diseases.	Diarrhoeal diseases.	Diseases of digestive system (not diarrhoeal).	Diseases of urinary system.	Diseases of circulatory system.	Diseases of nervous system.	Cancer.	Accidents and violence.	Old age.	Unclassified.
MARITIME DISTRICT:																											
New York City.....	1,326,958	2,543	22.43	1,298	47.5	2	0	66	57	0	19	26	0	19	209	327	467	20	301	142	155	133	217	53	105	187	0
Brooklyn.....	641,526	1,181	21.99	548	46.4	1	0	19	41	0	8	4	0	19	79	124	150	11	149	68	51	56	120	0	26	17	23
New Lots.....	17,000	47	33.18	18	38.3	0	0	0	0	0	0	0	0	0	5	0	9	0	0	0	0	0	0	0	0	1	3
New Utrecht.....	4,712	12	39.37	3	25	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Flatlands.....	3,127	8	30.7	3	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Long Island City.....	21,000	47	25.6	31	65.9	1	0	0	0	0	0	0	0	0	1	0	11	0	0	0	0	0	0	0	0	0	0
Newtown.....	10,000	36	43.2	14	38.9	0	0	0	0	0	0	0	0	0	2	4	7	1	1	0	0	0	0	0	0	0	0
Oyster Bay.....	12,000	17	17	6	35.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hempstead.....	18,100	11	7.33	2	18.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Hempstead.....	8,600	10	15	3	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sag Harbor.....	2,600	2	8	0	62.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southold.....	7,257	8	13.21	5	62.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southampton.....	6,332	9	17	0	62.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northfield.....	7,014	2	3.43	0	46.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Westfield.....	5,258	13	29.43	6	46.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yonkers.....	22,000	41	22.36	16	39.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Westchester.....	6,900	7	12.17	3	42.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rye.....	7,300	7	11.2	1	14.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sing Sing.....	6,500	7	12.92	1	14.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rest of District.....	.....	32	.....	9	18.8	0	0	0	1	0	0	0	1	0	0	1	11	0	1	3	3	1	6	2	0	1	4
HUDSON VALLEY DISTRICT:																											
Albany.....	67,314	142	18.25	52	35.1	2	0	3	0	0	2	0	0	2	16	15	24	0	8	6	9	13	15	4	4	16	20
Cohoes.....	20,000	17	1.2	4	37.1	0	0	0	0	0	0	0	0	0	3	1	1	0	0	0	0	0	0	0	0	0	0
West Troy.....	13,000	17	13.09	7	41.2	0	0	0	0	0	0	0	0	0	4	4	1	0	0	0	0	0	0	0	0	0	0
Hoosick Falls.....	6,500	8	11.77	1	12.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Troy.....	68,000	26	11.4	26	37.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laurensburgh.....	8,500	27	38.11	12	41.1	0	0	0	0	0	0	0	0	0	9	5	1	1	4	0	3	11	14	1	1	1	3

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MONTHLY BULLETIN OF THE NEW YORK STATE BOARD OF HEALTH—(Continued).

	Population.	Total number of deaths.	Representing annual death-rate per 1,000 of—	Deaths under five years.	Percentage of deaths under five years to total deaths.	Cerebro-spinal fever.	Typhus fever.	Typhoid fever.	Malarial diseases.	Small-pox.	Scarlet fever.	Measles.	Erysipelas.	Whooping cough.	Croup and diphtheria.	Acute respiratory diseases.	Consumption.	Puerperal diseases.	Diarrhoeal diseases.	Diseases of digestive system (not diarrhoeal).	Diseases of urinary system.	Diseases of circulatory system.	Diseases of nervous system.	Cancer.	Accidents and violence.	Old age.	Unclassified.
SOUTHERN TIER DISTRICT:																											
Elmira	20,541	23	13.46	7	30.4	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	1	1	0	1	1	1	5
Horseheads	3,449	2	6.95	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Bath	7,394	9	14.60	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Jamestown	12,000	14	14	5	35.7	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Westfield	3,500	7	24	2	28.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Predonia	2,800	2	8.57	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Clean	8,000	16	24	5	31.2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Rest of District.....	.....	13	.....	3	23.1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
EAST CENTRAL DISTRICT:																											
Watson	3,541	5	17	0	.....	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Franklin	3,000	6	20	1	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Coopers town	2,500	8	28.8	2	25	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Oneonta	4,063	8	19.2	2	16.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Cazenovia	3,685	6	16.54	2	33.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Brookfield	3,755	6	16.17	2	33.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Norwich	3,795	2	7.75	2	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Schenectady	65,000	66	12.2	12	18.2	2	0	2	1	0	0	0	0	0	5	5	10	0	0	0	0	0	0	0	0	0	1
Baldwinsville	3,000	3	12	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Homer	3,500	1	3.43	0	.....	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Rest of District.....	.....	49	.....	9	18.4	0	0	5	1	0	0	0	0	1	0	3	4	2	0	0	2	2	3	2	0	0	10
WEST CENTRAL DISTRICT:																											
Auburn	26,000	31	14.31	9	29	0	0	0	0	0	0	0	1	0	0	1	9	0	0	0	0	0	0	0	0	0	3
Sterling	3,034	4	16	1	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Ithaca	12,000	13	13	3	23.1	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Watertown	5,000	2	4.8	1	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Seneca Falls	6,853	9	15.78	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Manchester	4,000	1	3	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Phelps	7,000	1	12	2	28.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Geneva	6,000	11	21	4	36.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Victor	2,804	3	12.86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

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REMARKS.—The total reported mortality for the month is 5,871, the smallest number since June. Estimating the present population of the State at 5,350,000, an annual death-rate of twenty per thousand would give an average monthly mortality of 9,015, which shows that the returns are yet by no means complete. The percentage of infant mortality is 41. The percentage of mortality from acute respiratory diseases is 10.8; from consumption, 15.4; from diarrheal diseases, 11.1; from croup and pneumonia, 7.1; from typhoid fever, 3.0; from all other zymotic diseases, 5.2.

MONTHLY BULLETIN OF THE NEW YORK STATE BOARD OF HEALTH.

Abstract of reports of deaths and their causes in the following districts, cities and towns, during November, 1884.

Population.	Total number of deaths.	Representing annual death-rate per 1,000 of—	Deaths under five years.	Percentage of deaths under five years to total deaths.	Cerebro-spinal fever.	Typhus fever.	Typhoid fever.	Malarial diseases.	Small-pox.	Scarlet fever.	Measles.	Erysipelas.	Whooping cough.	Croup and diphtheria.	Acute respiratory diseases.	Consumption.	Puerperal diseases.	Diarrhoeal diseases.	Diseases of digestive system (not diarrhoeal).	Diseases of urinary system.	Diseases of circulatory system.	Diseases of nervous system.	Cancer.	Accidents and violence.	Old age.	Unclassified.	
MARITIME DISTRICT:																											
New York city	1,376,958	24.82	1,061	37.8	17	0	54	39	0	50	70	5	42	237	458	470	33	95	136	163	155	203	60	110	208	202	
Brooklyn	614,526	19.83	391	36.6	0	0	13	32	0	7	6	0	11	87	196	170	13	31	53	99	72	90	2	36	33	66	
New York	17,000	20.47	8	27.5	0	0	2	0	0	3	0	0	4	0	1	0	0	0	1	1	0	0	0	1	0	1	
New Roch	29	15.32	33.3	66.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
New Roch	3,127	34.53	6	66.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Flatlands	4,742	.....	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Long Island City	21,000	.....	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Newtown	10,000	22.26	8	36.4	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Oyster Bay	12,000	18	4	22.2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Flushing	15,519	10.06	4	30.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
North Hempstead	8,000	10	3	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sag Harbor	3,000	15.32	8	16.6	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Babylon	4,739	6	1	14.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Southold	7,267	11.56	1	28.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Southampton	6,332	7	2	25.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Northfield	7,014	4	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Westfield	5,289	11.32	1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yonkers	22,000	14.18	3	26.9	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Westchester	6,900	10.43	7	50	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Rye	7,500	9.6	1	16.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sing Sing	6,500	16.62	2	22.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Rest of district .....	.....	.....	2	11.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HUDSON VALLEY DISTRICT:																											
Albany	97,344	17.39	31	22	1	0	5	0	0	0	0	0	0	9	19	27	1	4	7	5	6	21	9	3	6	18	
Cohoes	20,000	7.2	5	41.7	0	0	0	0	0	0	0	0	0	4	3	3	0	0	1	1	1	1	0	0	0	0	
West Troy	13,000	18.46	5	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	0	0	0	0	
Hoosick Falls	6,500	7	1	14.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Troy	60,000	8.6	9	14	0	0	3	1	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	
Lansingburgh	8,500	29.64	4	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	1	0	0	0	0	0	

Green Island.....	5,000	7	15.8	2	28.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0</
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* Total deaths for 1884, 14,116; rate, 21.89,

MONTHLY BULLETIN OF THE NEW YORK STATE BOARD OF HEALTH — (Continued).

	Population.	Total number of deaths.	Representing annual death-rate per 1,000 of	Deaths under five years.	Percentage of deaths under five years to total deaths.	Cerebro-spinal fever.	Typhus fever.	Typhoid fever.	Malarial diseases.	Small-pox.	Scarlet fever.	Measles.	Erysipelas.	Whooping cough.	Croup and diphtheria.	Acute respiratory diseases.	Consumption.	Puerperal diseases.	Diarrhoeal diseases.	Diseases of digestive system (not diarrhoeal).	Diseases of urinary system.	Diseases of circulatory system.	Diseases of nervous system.	Cancer.	Accidents and violence.	Old age.	Unclassified.
SOUTHERN TIER DISTRICT:																											
Bingham	20,000	24	14.45	1	4.2	0	0	0	0	0	0	0	0	0	0	0	4	4	0	1	0	2	4	0	0	0	4
Buffalo	2,577	0	13.97	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cattaraugus Valley	4,323	3	11.1	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canisteo	25,000	36	17.28	7	19.5	0	0	0	0	0	0	0	0	0	0	0	4	0	1	0	0	0	0	0	0	0	0
Elmira	25,000	9	14.6	1	11.1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Bath	7,400	10	10.6	5	50	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
Jamesstown	12,000	5	17.14	0	.....	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Westfield	3,500	1	4.45	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fredonia	2,700	1	.....	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rest of district	.....	16	.....	2	12.5	0	0	0	0	0	1	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0
EAST CENTRAL DISTRICT:																											
Walton	3,541	2	6.78	0	.....	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
Delhi	2,941	3	12	0	33.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Franklin	3,000	1	4	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Coopersstown	3,000	1	4	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oneonta	5,000	2	16.8	0	28.6	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Worcester	3,000	4	4	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cazenovia	4,353	5	13.75	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brookfield	3,685	2	6.51	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Norwich	5,755	5	10.42	0	.....	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Syracuse	65,000	85	15.69	23	27	0	1	0	0	0	0	0	0	0	0	0	11	10	0	0	1	0	0	0	0	0	0
Geddes	7,000	4	6.86	1	25	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0
Homer	3,500	6	20.57	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rest of district	.....	56	.....	7	12.5	1	0	0	0	0	0	0	0	0	0	0	13	6	1	0	0	0	0	0	0	0	0
WEST CENTRAL DISTRICT:																											
Auburn	26,000	21	9.7	1	4.8	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	1	0	0	0	0	0	0
Ithaca	11,198	6	6.43	0	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Groton	3,450	7	24.35	2	28.6	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Seneca Falls	6,853	8	14.01	1	12.5	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0

[illegible]

* Six deaths in Monroe county hospital not included.

REMARKS.—The total reported mortality for the month is 6,378. The percentage of infant mortality is 33.6. From acute respiratory diseases the percentage of mortality is 18.8; from consumption, 14.6; from diphtheria and croup, 1.8; from typhoid fever, 1.6; from all zymotic diseases, 17.9. Diphtheria continues to prevail, the relative mortality being the same as in November. The greatest mortality for the month is from acute respiratory diseases. The returns for the month are more complete than last month, but still from many localities are less than they should be, assuming a rate of twenty per thousand annually as a low average for towns large enough to show little vaccination monthly. In Troy the actual burials for November were found, on investigation, to be 146, but forty-three having been reported; the December returns show improvement, but are still incomplete. The returns from Cohoes are utterly unreliable, and are now under investigation by this board. The average annual death-rate of 108 localities is about fifteen.

DRAINAGE, SEWERAGE AND TOPOGRAPHY.

REPORT.

ON DRAINAGE OF CHEMUNG CANAL PRISM AND ADJOINING MARSH IN THE VILLAGE OF HORSEHEADS, BY O. S. WILSON, C. E., DECEMBER, 1884.

JAMES T. GARDINER, Esq., *Chairman of the Committee on Sewerage, Drainage and Topography of the New York State Board of Health :*

SIR — I submit the following report on the sanitary improvement of the canal prism and adjacent marsh at Horseheads :

From the saw-mill to the E. C. & N. R. R. crossing the sewer pipe is laid, which will drain the water from this portion of the canal, with the possible exception of two or three small springs.

This part of the canal is the property of the E. C. & N. R. R. Co., and they have been notified by the village board of health to cover the bottom of the prism to a depth of at least six inches with gravel or coal ashes before March 1st next, and will probably do so. There may be needed a short system of drain tile in connection with the filling mentioned above.

As there are several openings into the sewer available there will be no obstacles to overcome in putting this portion of the canal bed in good sanitary condition. The part needing most attention is *from the E. C. & N. R. R. crossing to summit dam, including the feeder to the first lock.*

The catchment basin at the north end of the sewer is just north of the line of the E. C. & N. R. R. embankment. See accompanying map.

There are three ways of putting this portion of the canal in good sanitary condition :

1. *Filling it with clean gravel or earth.* This would require an expenditure of at least \$10,000. Although in my opinion it is the best plan, its expense bars it from present consideration.

2. *Tile draining.* By starting at the catchment basin at the inlet on the north side and laying three lines of six-inch drain tile on firm bottom — using boards where the bottom is soft — at a

uniform grade of about one in 800, taking in any springs from the west bank with smaller tile where they will suffice, the canal bottom could be rendered dry after the spring rains and freshets are over. The feeder can be arranged in a similar manner, emptying into the catchment basin through the west inlet. The tile in the feeder can be laid at a better grade, say one to 400. At least three lines of six-inch tile should be laid from the basin to the lock and sufficient smaller tile to and along the sides to keep the surface dry during warm weather. The location for side drains can best be determined after digging the trenches has commenced.

After the tile are put in, the bottom of the canal and feeder should be cleaned of all mud containing decaying vegetation, and be filled six inches or a foot with clean gravel. This would require about --

10, 000 six-inch tile, at \$30 per thousand.....	\$300 00
4, 000 four-inch tile, at \$15 per thousand	60 00
10, 000 feet boards, at \$15 per thousand	150 00
14, 000 feet trench digging and filling, at 3 cts.....	420 00
Cleaning canal bottom	500 00
Filling in canal bottom, six inches deep.....	2, 000 00
Total	<u>\$3, 430 00</u>

There is very little money available for any work, consequently the expense attending this plan and the necessity of rendering the canal as harmless as possible before the coming summer, has led me to suggest the following as the most feasible plan under the circumstances.

3. *Cleaning the canal bed and flooding with water.* The canal bed should be cleaned of all rubbish and decaying vegetation, care being taken that all vegetation of last season's growth be taken out; besides this, as much of the sedimentary mud — the accumulation of fifty years' use of the canal — should be removed at the first cleaning as possible with the funds available.

The flooding can best be accomplished by building the catchment basin at the head of the sewer higher — say to the level of the surface of the water in the canal last July, or 6.5 feet above bottom of outlet sewer. In building the catchment basin higher a stone wall two feet thick should be laid in mortar on top of the present wall to the height given above. There are nearly enough good stone on the ground for this purpose. The basin should be puddled on

the outside with clay to prevent leakage. There is an abundance of good clay at hand for this purpose. At the north-west corner of the top of the basin a channel six or eight inches deep by two feet wide should be made to allow the overflow to enter the basin in one stream. This can be so arranged with slash-boards as to admit of a constant overflow into the sewer during a dry summer and fall, with a little attention.

From one of the inlet openings — now closed — in north or west sides of the basin a pipe should be arranged with a gate in such a way that the canal can be emptied of water at any time for cleaning the bottom. This pipe and gate can be arranged in various ways; so I leave it to be done as seems most expedient. This cleaning of the bottom should be done as often as necessary to keep the water pure and free of decaying vegetable matter. It may not be needed oftener than once in three or five years after the present mud is taken out, providing proper precautions are taken to keep rubbish and other pollution out of the canal. I would here call the attention of the village board of health to the privies along the canal bank. They should be inspected and none allowed to remain within fifty feet of the bank where a vault is used.

In cleaning the canal the rubbish and filthiest mud should be thrown out and carted to some depression away from habitations and covered up with clean earth. The other mud can be thrown out and allowed to drain and freeze this winter when it can be carted on to fields, spread thin and plowed under in the spring.

THE MARSH EAST OF THE CANAL.

As this is doubtless a fruitful source of malaria in the village, I deem it best to recall attention to it here. As will be seen from the old map, a copy of which accompanies this report, Mud brook formerly ran in the present canal bottom opposite the marsh referred to, but was deflected into a ditch, dug for the purpose by the State, when the canal was constructed; said ditch, now nearly filled with silt and vegetation, lies between the marsh and canal.

The sewer being six feet below the present water surface of the brook, ample fall is provided for draining the brook and marsh into it, the only obstacle being *McComber's tannery*.

Mr. McComber has the right to use Mud brook at its present height in his tannery, but is not willing to give up this privilege for the benefit he would derive from being able to drain his marsh land. He has, however, agreed to allow the brook to be taken into the

sewer, provided he is furnished with water from the canal. When the canal is flooded, as proposed above, this water can be obtained, and, by laying 300 feet of pipe, led to his vat, sixty feet of pipe will lead the overflow from the vat back into the sewer. The expense attending this will depend somewhat on the size of pipe used. With the slight fall now existing to the present vat a six-inch pipe will give him all the water he needs; while a four-inch pipe will carry the same water from the vat to the sewer.

The following is, I think, a liberal estimate for this work :

300 feet six-inch cast-iron pipe at 35 cts.....	\$105 00
60 feet four-inch pipe at 20 cts.....	12 00
Laying 360 feet of pipe at 10 cts.....	36 00
Total	<u>\$153 00</u>

As the water, after passing through his vat, is comparatively pure, it will do no harm to the sewer and will be available for fire purposes, as it is emptied into the sewer above the first man-hole. The vat referred to is the one in which hides are soaked before being put into the lime vat for removing the hair. The lime vat as well as those containing the different solutions used in tanning are never emptied, so that no pollution need be feared from having the tannery connected with the sewer. The size of the pipe given above is calculated to answer if the pipe from the canal to the vat is laid about two feet below the surface of the ground. A five-inch pipe would answer the purpose as well or better if put four or five feet below the surface of ground entering the vat near the bottom; the water escaping from the four-inch pipe near the top. The more expensive digging would overbalance the saving in size of pipe, in my opinion.

DRAINING THE MARSH.

The tannery being provided for, I would suggest that a broad clay dam be made across Mud brook on Mr. Westlake's land, about where shown on map, and a channel cut from the brook to empty into the canal opposite said dam. This will provide for the water coming from the springs at the source of the brook. Below the drain a ditch should be dug, keeping about fifteen feet to the east of the tow-path bank, gradually deepening, running south until opposite the catchment basin, where it should be six feet below present water surface of brook, or at the level of the outlet sewer, where

a settling basin should be made about six feet by ten feet in size, which can be connected through the tow-path with the catchment basin, through its east inlet, by a pipe twelve inches or larger in diameter.

This ditch will intercept all water leaking through from the canal and be deep enough to lead drain tile into for draining the whole marsh. The object of the settling basin at the south end of this ditch is to provide for an accumulation of silt there and not throw it into the sewer catchment basin. This settling basin should be watched and be cleaned as often as necessary.

It is clearly the duty of the property owners benefited to meet the expense of the drainage of this marsh, and as it is at present detrimental to public health it should be drained. No single individual should be allowed to stand in the way of its being done.

FRESHETS.

While it is my belief that the present sewer will carry away all the water that comes into the canal and feeder above it, it may be well to have an additional outlet for the overflow. This can be obtained by having the E. C. & W. R. R. take up and relay the pipe already under the embankment at their crossing — at present there are two lengths about 66 feet long of oval cement pipe 22 in. x 28 in. about 10 feet apart — one of these can be taken up and placed at the end of the other, which will carry it through the present filling below the embankment. Care should be taken that culverts shall be placed through any tracks or sidings hereafter put in or across the canal bed — thus leaving a surface channel to the creek for freshet water, unless time and experience shall prove that it is not needed.

CONCLUSION.

It may be well to record here the distances along the sewer to the various connections and openings into the same, beginning at the south end of sewer:

	Feet.
Mouth of sewer.....	00
Village fire man-hole.....	245
State connection through railroad culvert.....	880
State man-hole.....	936
Village fire man-hole.....	1107
Village connection.....	1565

	Feet.
Village fire man-hole.....	1817
Village connection.....	1847
Village connection.....	2072
Village fire man-hole.....	2107
Connection for Mud brook.....	2242
North end of sewer	2559

Should it be deemed necessary, after the work suggested in the last plan is carried out, to drain the canal before the sanitary conditions are satisfactory, but little of the work previously done will be thrown away, as the mud in the bottom should be cleaned out and removed in any plan adopted.

Respectfully submitted,

O. S. WILSON,

Civil Engineer.

KEUKA, December 30, 1884.

MAP

SHOWING THE ORIGINAL COURSE

— OF —

MUD BROOK,

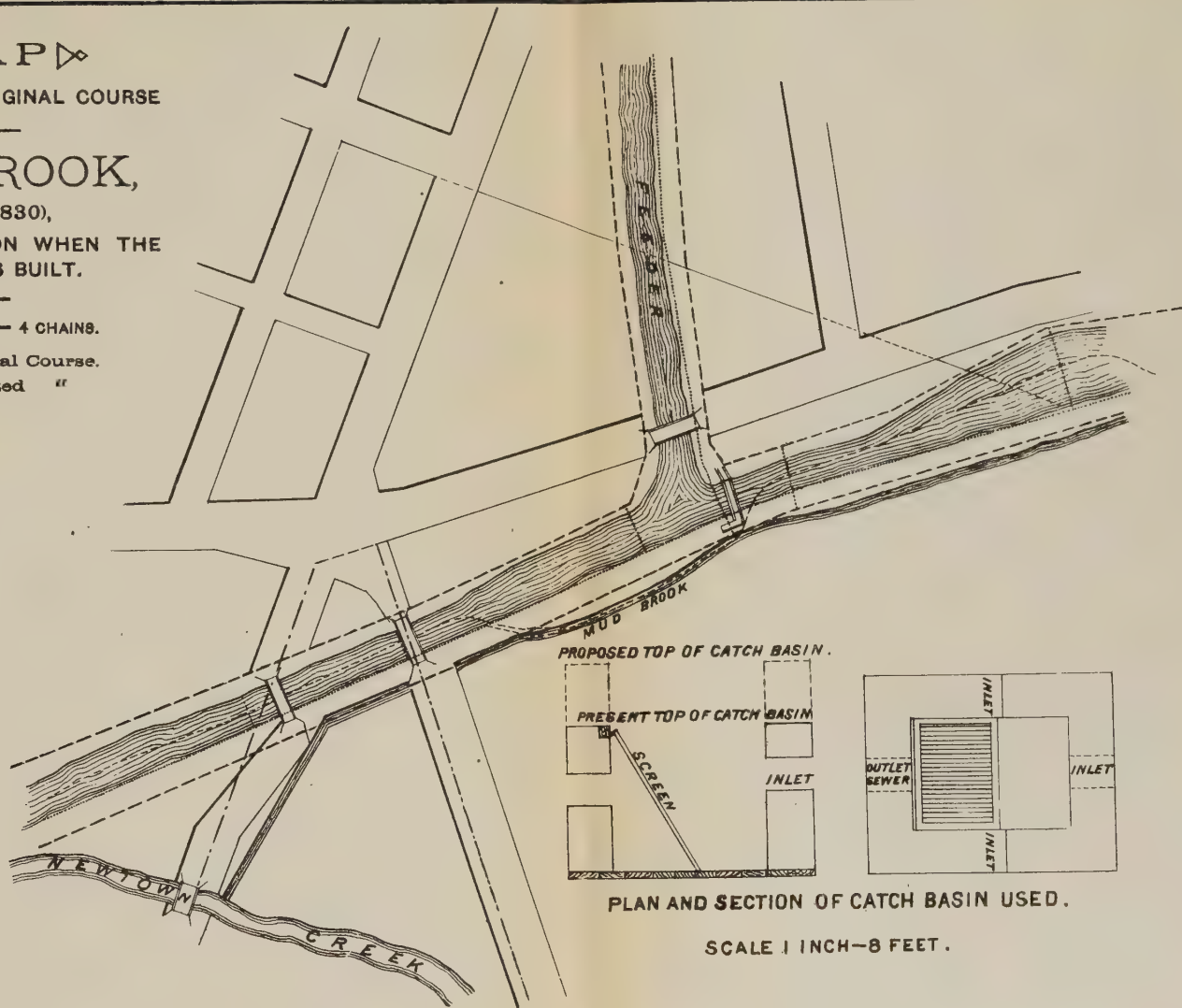
(About 1830),

AND ITS DIVERSION WHEN THE
CANAL WAS BUILT.

SCALE.—1 INCH — 4 CHAINS.

Dotted Line—Original Course.

Full " —Diverted "

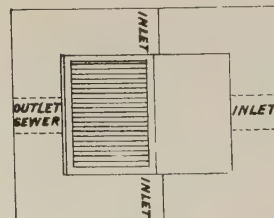


PROPOSED TOP OF CATCH BASIN.

PRESENT TOP OF CATCH BASIN

SCREEN

INLET



PLAN AND SECTION OF CATCH BASIN USED.

SCALE 1 INCH—8 FEET.

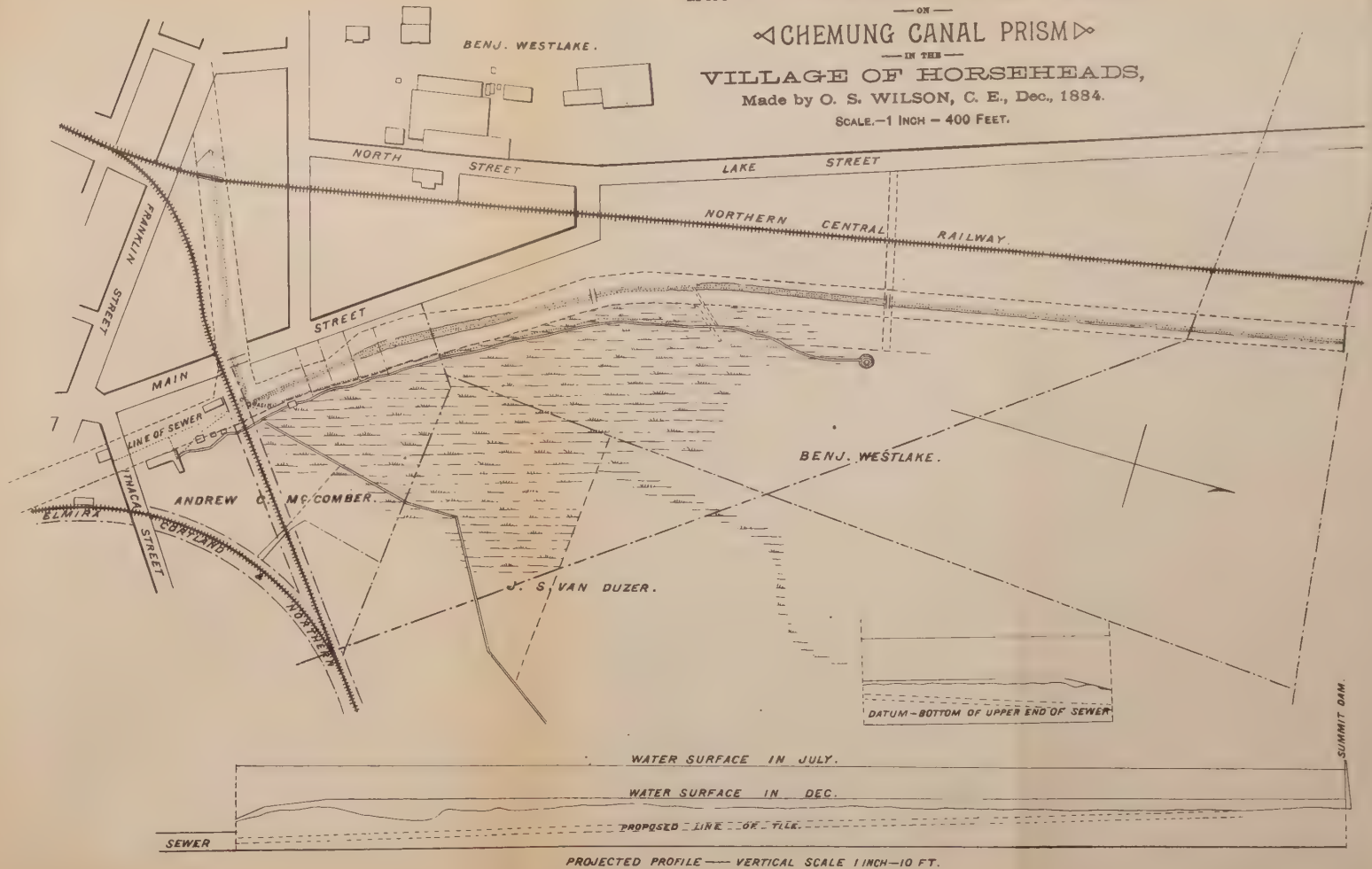
N. Y. STATE BOARD OF HEALTH.
 MAP TO ACCOMPANY SANITARY REPORT

—ON—
 ◁CHEMUNG CANAL PRISM▷

—IN THE—
 VILLAGE OF HORSEHEADS,

Made by O. S. WILSON, C. E., Dec., 1884.

SCALE.—1 INCH = 400 FEET.



REPORT.

ALBANY, *January 8, 1884.*

To the Board of Health of Peekskill, EUGENE B. TRAVIS, Esq.,
Secretary ;

GENTLEMEN — On November 21st ult., during the regular quarterly meeting of the State Board of Health, a telegram was received from you requesting, on behalf of the village board of health, a plan of sewerage for the village of Peekskill from the State Board of Health, and placing such request entirely upon sanitary grounds.

The Board considered your request, and understanding that the purpose of your action in thus asking assistance of the State Board of Health was, that you might secure for your village a system of sewers that should answer not only engineering requirements, but also meet those most important sanitary requirements essential to the health of the people, and in which the sewers of many towns have so lamentably failed, the Board voted

“That the telegram and request be referred to the committee on drainage, sewerage and topography, with discretionary power to advise and aid the local sanitary authorities of Peekskill in their effort to secure a sanitary system of sewerage.”

In accordance with this authority and direction, Mr. James T. Gardiner, the chairman of the committee on drainage, sewerage and topography, visited Peekskill November 30th, and met your board on the evening of that day.

The next morning, in company with Mr. Travis, and Mr. Hart of your board, Mr. Gardiner made an examination of the village with reference to the proper method of sewerage of its streets. The facts ascertained in this examination, together with the maps and street grades, which you furnished the State Board, have been carefully considered, and we are now ready to state briefly to you our conclusions, and the reasons therefor.

REPORT.

We find your village peculiarly adapted to a thorough system of drainage and sewerage. Lying, as it does, on the steep side-slopes of the valley of McGregor's brook, which descends rapidly to the Hudson, your question of sewerage is in no way complicated with that of the disposal of storm water. In the channel of the brook nature has provided for the rapid discharge of all the storm water of the village into the Hudson. At present, this brook channel running through the center of your town, is being used as an open sewer. In times of low water the filth discharged into this brook, lodging, as it must, along the borders of the channel becomes offensive to the senses, and furnishes those dangerous conditions which are liable at any time to prove one of the most essential factors in the outbreak of severe epidemics.

The public health of Peekskill is undoubtedly endangered by allowing the sewage of the village to pass into this brook, which runs through the most populous part of the town; but the use of the brook for carrying off storm water, which is rapidly discharged into it from the streets, can in no way injure the health of your people, but must rather tend to keep the channel of the brook in a wholesome condition.

You are, therefore, specially favored by nature in having most perfect means for discharging all the water that falls on the surface of the village, and, in our judgment, no artificial means are needed to secure surface drainage, except in one or two small spots, where, probably, the desired result can be better accomplished by under-draining the soil.

In the draining and sewerage of a town, there are three things to be considered and provided for—surface drainage, sub-soil drainage and sewerage. The first includes the disposal of the storm water that falls upon and runs off from the surface and roofs of the houses of the village; the second, the disposal of the sub-soil water that occasions wet cellars; and the third, the disposal of the sewage proper of the village, the latter consisting of the waste water from the houses, the sewage from the water-closets and privies, and any offensive wastes from factories or shops.

If in any town large sewers are built to carry off all of these three classes of waste fluid matter, such constructions are very costly. The storm water, liable to be discharged from any given area with steep, rocky slopes, is not infrequently fifty times as great in amount as the sewage proper from such a district. If, therefore, sewers are to be made to carry off storm water, they must be many times as large as would be required to carry off sewage alone.

To build such sewers is a very costly undertaking, and the results are generally very imperfect from a sanitary point of view.

In ordinary times the sewage fills but a very small portion of these large combined sewers. When, however, heavy rainfall occurs, the walls of these sewers, if of brick, are bathed and saturated with dilute sewage. On the recession of the storm water these brick sides of the sewers furnish those conditions which are extremely favorable to the growth of those low organisms or *bacteria*, which are believed to produce many serious diseases.

The investigations of Koch and others, during the past ten years, have thrown great light upon the causes of many of the diseases connected with filth, rendering it probable that they are due to microscopic organisms. These diseases are popularly known as the germ diseases. A number of the most serious ills which afflict mankind are now supposed to have their origin in connection with these microscopic organisms which, under favorable circumstances, rapidly multiply and destroy animal vitality.

The conditions prevailing in large sewers are known to be favorable to the growth of lower organisms. Moisture, heat, the presence of ammonia and darkness, are all important elements in producing these little deadly organisms, of whose habits much now is known through the process of artificial propagation.

Until these discoveries, concerning the probable origin of diseases, which have all been made within the past few years, it was supposed that large sewers could be made to answer sanitary purposes.

When large sewers were first introduced into the towns that had no sewer systems there was a marked improvement in the public health; but as the so-called "modern conveniences" began to be introduced into the interior of dwellings, so that the air from the sewers could escape into the houses through defective plumbing and otherwise, physicians observed a class of diseases which they ascribed to sewer gases, supposing that it was some gas generated by fermentation in the sewer which was the cause of disease.

Basing their action on this assumption, that a gas was the cause of sewer diseases, engineers, until within a very short time, have supposed that if they could make sewers which would carry off sewage without fermentation, and could so ventilate sewers as to carry off any gas that might be formed, they would no longer be unwholesome.

The results of modern sanitary investigation as to the cause and favoring conditions of these sewer diseases show, that while the escape of gases from sewers into human dwellings may lower the tone and resisting power of the human system, the gases themselves are not, probably, the cause of specific disease.

The air from a sewer where no gas is formed, but where the germs of enteric or typhoid fever are planted, may be more fatal to the human system than some of the worst smelling gases that originate in the fermentation of sewage.

It is for this reason that the sanitarians who are thoroughly conversant with the recent discoveries in the origin of diseases feel grave doubt as to whether large sewers can be made safe from a sanitary point of view.

It is the judgment of the State Board of Health that large brick sewers, planned to carry storm water and sewage, should never be used when they can possibly be avoided. In the village of Peekskill they are entirely unnecessary. The storm water from your roofs and streets and yards is at present flowing rapidly off into the brook which runs through the village and thence into the Hudson, without occasioning any inconvenience. You may safely continue to let nature dispose of the storm water in the natural way, letting it flow off into the brook and into the river.

Within the past three years you have, however, introduced a supply of water to the village; many citizens have now water-closets, and all are using greatly increased quantities of water in their dwellings. This waste water from the houses is either being discharged into cesspools, or, in certain cases, by short drains from those dwellings in the central part of the town, it is discharged into the creek. Either of these modes of disposal, by cesspool or by draining into the creek, is liable to seriously injure the health of your village.

The slopes on which Peekskill is built are of solid rock, covered with a thin coating of porous gravelly earth. Water thrown into cesspools, leaches rapidly through the soil and runs down along the surface of the rock, entering often the cellars of houses on streets below. The filth from cesspools on the higher streets may, in frequent instances, reach the ground around dwellings situated below them, and may enter the cellars and contaminate the air of the whole house. The use of cesspools is, therefore, specially dangerous in a village situated as yours is.

Before the citizens of Peekskill had ample water supply the evils from soakage of filthy water through the soil were very much less felt than they will be in the future. As the abundant use of water becomes more common in the houses, the danger of disease from soil pollution will become greatly aggravated.

We have already spoken of the evils which arise from draining into the open brook bed, running through the thickly populated part of your town. Your citizens are already so familiar with this evil that it is not necessary for us to dwell upon it.

Therefore there is no way for you to dispose of the sewage of your village in a healthful manner, except to build proper sewers for carrying it off to the river. Both for the sanitary reasons heretofore mentioned, and for the sake of economy, we recommend that these sewers be constructed to carry sewage only, and that no storm water be admitted to them.

In such a system the collecting sewers should be made of the best glazed pipe, and need not be over six inches in diameter. At the dead end of each branch of the sewer there should be an automatic flushing tank, discharging at least once in every 24 hours, and containing, perhaps, 140 gallons of water. As these small pipes run together the diameters of the sewers must be increased in proportion to the amount of water to be carried.

It will be necessary to carry outfall sewers down the principal streets on both sides of the brook as far as the flat ground along the river where they may be united for common discharge near the mouth of the creek. This outlet of the sewer into the river should be carried so far out as to have its mouth always below low-water line.

The pressure of the water flowing down from the hills will cause a constant discharge from the pipes, even when they are below low water. The system which we here recommend to you is the separate system of sewerage, as it has been applied in this country in Memphis, Tenn., Norfolk, Va., Keene, N. H., Kalamazoo, Mich., West New Brighton, N. Y., and other places.

The objections originally made to these small sewers, that they are liable to constant stoppage, have not proved to be well founded. They are a practical success in all these places. In Memphis they have now been in operation over three years.

From a sanitary point of view these small sewers made of glazed pipe, running from one-half to three-quarters full of sewage, constantly and thoroughly flushed by the discharge of flushing tanks, have proved very greatly superior to large sewers.

In point of economy the separate system has greatly the advantage. The cost is always less than half of that of the large combined sewers, and is sometimes but one-third to a quarter the cost.

In order that these sewers shall work properly they require many openings into the air. In Memphis these are secured by carrying every house-sewer through from the street sewer to the house without trapping, and there making connection with the open air through the soil-pipe, which is carried above the roof of the full size of the pipe, and left completely open at the end.

In our judgment this is not the safest arrangement. We advise that a trap be placed in the house sewer, just outside of the house. From the street side of this trap a pipe should rise to the roof of the

house, which would supply air to the sewer from the trap outward, and also supply air to the main sewer itself, thus securing a complete circulation of air through the branch sewer leading from the house, and through the street sewer. On the house side of the trap before spoken of, another pipe should rise to the roof of the house, supplying air for the house part of the drain alone. This is technically known as a foot vent to the house drain. The soil-pipe should then be carried directly up to the roof, and above it, the full size of the pipe. The house drain has thus two openings to the fresh air, and a complete circuit of air is secured through the drain inside of the house, while the pipe coming from the street side of the trap ventilates the street sewer and the house branch.

In recent sanitary practice it has been found that nothing so thoroughly conduces to the purification of drains as the discharge through them of a strong current of fresh air. The expenditure necessary to secure this is, in our judgment, amply repaid by the security gained. In many places it has been the custom to make the foot-vent of the house drain, which opens into the house drain on the house side of the trap, a short pipe merely rising to the surface and turning over with a crook, to prevent any thing being thrown down the pipe. The result of our investigations is to show that there is often an outward current from the foot-vent of the house drain, and that, therefore, the air of the drain is liable to be discharged under the windows of the house, unless this foot-vent is carried up to the roof.

This outward flow of air from the foot-vent is found to occur whenever a bath-tub or closet is discharged in the house. But this is a mere puff of air, driven out of the foot-vent for a few seconds by the movement of the water through the drain.

During the summer, when the air in the house is often much cooler than the external air, a reversion of the current in the drain is likely to occur, and a more or less continuous outflow of drain air takes place at the foot-vent.

In the accompanying diagram is shown the method of ventilating the house drains and sewer of which we approve, and the construction of a *short* foot-vent of which we disapprove.

We refer to this question of house drains because with separate sewers it is necessary that the house drainage should be planned to accord with the sewers, or the sewers will not work properly.

SUBSOIL DRAINAGE.

Where the separate system of sewers has been built by the Drainage Construction Company of Boston they have laid in the same

trench with the sewer pipes a line of agricultural drain tile to under-drain the soil of the street.

We recommend that a line of drain tile should be laid on both sides of the sewer pipe and that drain tile be laid in the trench with the branch sewers that run up to the houses. When trenches are opened for laying the branch sewers the laying of an additional line of porous drain tile is a very small added cost, but the result is to secure the complete underdrainage of the soil about the house.

We consider that in the case of Peekskill, as of almost all other places the laying of a system of sub-soil drains with the sewers is a very great advantage to the health of the place; while the cost is very small.

It is not necessary for us in this report to enter into all the details of the plan for a system of separate sewers to carry off the sewage of Peekskill; the map furnished us shows that about 65,000 feet of sewer will be needed to completely provide for the wants of the town. The only uncertainty as to the cost of such sewers arises from the difficulty of determining beforehand how much rock excavation will be required in the trenches of these sewers, but from the best data which can be had, derived from the experience of laying water and gas-pipes through the town, it is probable that the total cost of the sewers and sub soil drains for the village would not exceed \$85,000, and it might be done for much less if the amount of rock to be excavated proves small.

The cost of sewerage and draining the city of Keene, where 61,200 feet of sewer was required, was \$74,000. This work was done by the Drainage Construction Company before mentioned.

It appears, therefore, that the work at Peekskill should certainly be accomplished for the sum mentioned.

The success of the separate system depends largely upon the precision with which the work is executed and the quality of the materials used, both as to pipe and cement. Where these works have been imperfectly done, or poor material has been used, the results are not satisfactory.

A great deal of discussion has taken place as to the number of man-holes which should be built. It is our judgment that if properly constructed, as they have been built at Keene, a large number of man-holes will be of decided assistance in examining the working of the sewers and in keeping them free from obstructions; while if constructed and covered, as done by the Drainage Construction Company in the sewerage of Keene, they are perfectly safe from a sanitary point of view.

There are many details of improvements which this company have developed from the result of their experience applied in the sewerage of Keene, N. H., which should be used in the sewers of Peekskill, but these are matters of minor detail of construction which cannot be con-

sidered without the aid of drawings, and it is not necessary to discuss them at present.

It is advisable for sanitary reasons that the sub-soil drains should not have their outlet into sewers.

In conclusion, therefore, we earnestly advise that the village of Peekskill take immediate measures to secure a thorough system of separate sewers, to carry off the sewage alone, and a system of sub-soil drains, laid in the same trenches with the sewers, to remove all soil moisture from about the houses, and we strongly advise, both for sanitary and economical reasons, that large combined sewers, to carry off sewage and storm water together, should not be constructed.

JAMES T. GARDINER,
Chairman.

EDWARD M. MOORE,
President.

ERASTUS BROOKS,
ELISHA HARRIS,
Secretary.

Resolution of the State Board of Health. At a special meeting of the Board, held in Albany, February 22, the above report was presented and adopted by the Board, and on motion was ordered printed.

FREDERICK CARMAN,
Acting Secretary.

REPORT ON THE SANITARY CONDITION OF THE CITY OF SCHENECTADY.

To the Board of Health of the City of Schenectady :

In January last a complaint was received from your board regarding the unsanitary condition of Mill creek, south of the Erie canal, setting forth that the culvert under the Erie canal over which Mill creek ought to flow is filled up so that nothing except water, and not all of that, can get through it; and that an immense amount of debris collects at the mouth of the culvert. And further stating that the health officer of your city was authorized to confer with the State Board of Health in reference to the nuisance caused by the obstruction in Mill creek culvert.

From a previous complaint on this subject it appears that the condition of Mill creek from the Central railroad culvert down to the river is considered detrimental to the public health of Schenectady, and that this condition of the creek is supposed to be due wholly or in part to the obstruction caused by the culvert under the Erie canal.

In response to this complaint the State Board of Health informed Health Officer Van Zandt that they would make a careful examination of the question and report the results.

At the last meeting of the State Board this complaint was referred with power to the committee on drainage, sewerage and topography who, after the necessary examination, report the following facts and conclusions :

REPORT.

It is evident to the committee that several questions are involved in the proper treatment of this subject. First, is there evidence that the health of Schenectady is being injuriously affected by some cause or causes of a character capable of being removed by sanitary

improvement? Second, if an unusual amount of illness is found to exist, what kinds of causes are indicated by its nature and distribution? Third, a description of the unsanitary conditions which are indicated by the character and distribution of the disease. Fourth, the proper remedy for these conditions. Fifth, the responsibility for the execution of the needed sanitary improvement.

Condition of the Public Health of Schenectady.—Dr. Alfred L. Carroll, Secretary of this Board, visited Schenectady and made a careful examination of the mortuary records. Through information furnished by the health officer he was able to ascertain not only the number of deaths from the principal zymotic diseases, but also the localities where they occurred, so as to note them upon a map of the village.

Dr. Carroll's full report on the prevalence of filth and malarial diseases in Schenectady, and the causes thereof, is given in the appendix, which is well worthy a careful reading by every citizen of Schenectady.

The record is both sad and alarming. Sad, because it shows that at least one-fifth of the deaths in your city during the past year were clearly preventable by ordinary municipal provisions for cleanliness; alarming, because the already abnormal death rate from filth poisoning must, from the very nature of the cause, steadily increase. Dr. Carroll says "Schenectady affords another of the many lamentable illustrations of the apparently ineradicable popular delusion that natural water-courses are the proper receptacles for sewage and house refuse of all kinds. During the last year its mortuary records have shown thirty-three deaths from diphtheria, twenty-six from typhoid fever, forty-four from diarrhoea and twenty from scarlet fever, many cases of the latter malady assuming a malignant type. With an estimated population of fifteen thousand, these disorders have caused a yearly mortality of more than eight per thousand, whereas it is generally conceded that under ordinary favorable sanitary conditions, the annual death rate from the seven principal zymotic diseases combined should not exceed three per thousand of the population; furthermore when it is considered that the deaths from such diseases represent a comparatively small proportion of the actual number of cases occurring, the statistical testimony gains greater force. To put the statement in a different light: Although we have not accurate returns for the past years from Schenectady, it is probably not far wrong to estimate the average annual death rate at twenty-

four per thousand, in which case over one-third of the total mortality would be attributable to four maladies which are intensified if not directly caused by filth poisoning. In addition to these I am informed by Dr. H. C. Van Zandt, the health officer of the city, that malarial fevers are widely prevalent."

These facts speak so strongly for themselves that all who read them will doubtless agree with this committee that the city of Schenectady has become a very unhealthful place of residence.

Character and Distribution of the Diseases.—It appears from Dr. Carroll's report that the number of fatal cases from diphtheria, typhoid fever, diarrhoea, and scarlet fever is, at least, three times as great as it should be under normal sanitary conditions. These diseases are known to be intensified, if not directly caused, by filth poisoning. The prevalence of malarial diseases is also reported, although, from the fact that these cases are seldom fatal, it is very difficult to obtain accurate statistics regarding them. Still there seems to be no doubt that there is a large amount of malarial trouble in Schenectady. This disease is usually associated with surface or sub-soil saturation occurring either immediately around dwellings or within such a distance that miasmatic emanations may be carried by the winds over an inhabited locality. There appear, therefore, to be at least two prominent classes of more or less preventable diseases occurring in Schenectady, one of them dependent upon conditions of filth and the other upon undrained or saturated lands. The nature of these two classes leads to the conclusion, that filth is accumulating within the city of Schenectady in such a way, and in such places, as to affect the public health, and that there are saturated tracts in its neighborhood which produce malarial diseases.

Dr. Carroll's map of the distribution of fatal cases of diphtheria, typhoid fever, diarrhoea and scarlet fever shows that the majority of cases are in the neighborhood of certain brook channels which run through the city of Schenectady. This, at once, points to these open channels as being one of the controlling sources of the disease. This is also indicated by the remarkable fact noted by Dr. Carroll, that the mortality from the diseases in question coincides with the warmth of the season, the infection seemingly freezing out during the cold weather. He says where the draft or polluted ground air, or sewer gases are affecting the warm interior of the houses the evil consequences are commonly noticeable in seasons

when doors and windows are closed and the household fires lighted ; but where, as in the present instance, the festering heat of summer brings the chief incidents of filth disease, we must look to outdoor influences for an explanation. So far, therefore, as the filth diseases are concerned, the open brook channels are indicated as a prominent cause, both by the distribution of the fatal cases, and by the time of their occurrence. In addition to this, the polluted character of the water supply is doubtless acting over the whole city. The saturated ground indicated by the prevalence of malaria is not far off. Between the tracks of the New York Central and the Delaware and Hudson Canal Co.'s railroads, in the neighborhood of Mill creek, there lies a large tract of flat marshy land, sustaining a rank growth of vegetation, and alternately flooded in time of rain and dry in hot weather. This undrained tract itself supplies the conditions capable of producing malarial fever over the whole of Schenectady. From the edge of the marsh nearest the city it is but a little over half a mile across the city to the College grounds. It is well known that the miasmatic influence of swamps is easily carried over such a distance, and capable of injuring human health.

Description of Important Conditions Injurious to Health.—Through the center of the city of Schenectady runs a brook, called Cow Horn creek, which heads on the sandy hills south of the city, and runs with rapid current between and under the streets of one of the most densely inhabited quarters until it reaches the flat meadow land below the center of the city. Here it joins Mill creek, which comes in from the south-west, and the two united pass under the New York Central R. R., under the Erie canal, and under culverts at Church and Washington streets, and empty at last into a branch of the Mohawk. Cow Horn creek drains quite a large area. The slopes along its upper course are steep and the soil loose. The surface water of a large part of the city of Schenectady also drains into it. While at ordinary times the flow of water is small, the creek bears evidence of bringing down quite large volumes of water together with a great deal of silt. The chairman of this committee made a careful examination of the course of the brook from the Mohawk river to above Barrett street, and found evidence along its whole course of a rapid filling up of the brook channel with silt brought down from the steep and sandy upper part of the brook and lodged against the many obstructions which line the channel. The brook is used as an open sewer ; and in addition to the filth

from the sewage and house slops, which are thrown into the brook, there were found numerous pails, pans, fragments of barrels and other refuse, forming just sufficient obstruction to make a lodgment of the silt brought down in time of flood. Ashes, too, were frequently found along the steep banks which are characteristic of the brook in its course through the city.

The sand and material from the surface washing of the streets of Schenectady is also carried down into Cow Horn creek. Part of the channel therefore lying in the city above Center street, where the current is quite rapid, is being filled by various artificial and natural processes. It is difficult to say which is acting the more important part, the natural washing of the loose steep slopes on both sides of the channel, or the street washings and the filth of the surrounding houses together with the solid obstructions before mentioned. All these causes are working together to fill up the channel of Cow Horn creek, even where the descent is quite rapid through the city. Evidence of this may be seen at the Barrett street culvert, which is high above the meadows, and nearly filled with silt. There is no backing up of the water from the meadow into the city. The silting process is entirely dependent upon the conditions prevailing on the upper course of the brook through the city.

In addition to this filling up of the channel of the brook with filth and silt, the banks are in many places in a filthy condition from the throwing of house slops and refuse upon them. When the water in the creek is low the animal and vegetable organic matter lining its channel undergoes constant decomposition. The close proximity of much of the illness from zymotic diseases to this brook shows that this decaying animal and vegetable matter is affecting the health of the people who live in its neighborhood. While to a certain extent the silting process is in progress through the city, when the brook reaches the meadow where its fall becomes very slight, the natural process of filling its channel with material, brought down from above, goes on much more rapidly. At the time of the visit of the chairman of this committee the current was running uninterruptedly in the brook through the Central Railroad culvert and between it and the canal culvert. There was no backing up of the water by the canal culvert, but all the culverts examined in the lower part of the brook showed evidence that the deposit of silt was forming below the Erie canal culvert, as much as above it. That is, north of it as well as to the south. The whole bed of the brook

almost to the river is formed of this fine deposit, washed down from above, and the level of the bottom is almost the same on both sides of the canal culvert. It is only a few inches lower on the north side. There was no evidence that the canal culvert, or any of the numerous city culverts which cross this stream, have caused the deposit of silt which is slowly but surely filling the Cow Horn creek. The bottom of the brook is being slowly lifted up by the same natural processes which would have doubtless acted had there been no culverts on the stream. The amount of silt brought down is doubtless increased by the street washings of the city, by the ashes and other refuse thrown on its banks, and by the organic filth which is drained into it.

In addition to this the tar waste from the gas works which enters Mill creek just at the junction of Cow Horn in the meadows, is an important factor in increasing the filling. The bottom of the brook was found coated with a black tarry mass, as far down as the canal culvert. This running of tar into the brook channel not only gives an added amount of material to fill the brook, but prevents a scouring action of the current in removing silt.

The silting up of the brook channel through the meadows is further caused by the fact that often in the spring, when Cow Horn creek is bringing down a large volume of water and a mass of sediment, the water in the Mohawk river is so high as to set back through the canal culvert and cover the meadow lands lying between the railroad tracks. There is then no discharge for the water of Cow Horn and Mill creeks, and the sediment brought down their courses must be deposited in great part in the brook channel above the canal and the New York Central railroad. The meadow land through which this part of the channel flows is only ten feet above the river at low water, and the natural slope of this meadow land between Center street and the edge of the river bank was only a fall of about one foot in a quarter of a mile.

Had this brook been left to the untrammelled action of nature, the process of filling its lower channel with silt would very likely have gone on in the same way as at present, though not to the same extent, until the filling of the channel had proceeded so far that the water would find some new course for itself.

But, however this may be, it is clear from the topography and the action of the brook that the filling up of the channel is now a natural process, in no way dependent upon the canal culvert. Should the silt accumulate so as to raise the bottom of the brook

above the top of the canal culvert, it would be necessary to dig out the culvert and let the water go through.

Two effects are resulting from the condition of Cow Horn creek: a large amount of organic filth is being deposited along its lower course, and a very large amount of sewage discharged into the Mohawk river about two thousand feet above the point from which the water supply of the city is pumped. Furthermore the channel of the brook has become so shallow that the meadow land south of the New York Central railroad can no longer be drained into the brook. These flats have, therefore, become a swamp. The organic matter, which has been brought down by the creek, is apparently the cause of disease along its lower course; and it is unquestionably affecting the water supply of the city. The chairman of the committee found upon examination that the current from the mouth of Cow Horn creek went directly around to the point from which the water supply is taken. The wet lands are very probably the cause of miasms, affecting the health of a large number of people.

From Dr. Carroll's report and map it will be seen that there was formerly a branch of Cow Horn creek running between Albany street and the Albany turnpike. The condition of this old channel, which has been partially filled up, was not examined; but it will be seen from the map that a very large number of fatal cases of zymotic diseases have occurred in this neighborhood.

Proper Remedy for the Unwholesome Conditions.—The first and most important measure to stop the present death rate from filth diseases in Schenectady is to provide proper means of carrying away the organic filth of the city. The use of open brook channels as sewers should be absolutely prohibited. They should be reserved for the drainage of surface water only. Such a prohibition can hardly be made effectual until some means are provided for carrying the sewage away from the city. For this purpose a system of sewers is strongly advised, and little relief can be expected from the present unwholesome condition of the city until sewers have been built.

The surface drainage of Schenectady is so provided for by nature that no trouble is complained of from storm water. This is rapidly carried off from the city into the brooks, channels and into the river. It is, therefore, necessary only to provide for the removal of the sewage. For this purpose small pipe sewers of vitrified pipe, with flushing tanks for daily flushing of the sewers,

are advised, both because they are more economical and more cleanly.

Professor Staley has examined this question, and has already reported to you a plan for sewerage that provides for the efficient removal of the filth and sewage of the city. The construction of a system of sewerage is the very first step toward any sanitary improvement of your city. In addition to this, the bottom of Cow Horn creek should be cleaned and paved with cobble-stones. A proper grade should be adopted from Center street down to the river, and the silt should be dug out of the brook down to that grade. The bed should then be paved with cobble-stones, and should be kept clean of silt down to the cobble-stones by annual cleaning.

Careful inspection will be necessary to keep the filth from being thrown into the brook; but by the employment of an inspector, and by compelling householders to keep the brook clean through their premises, it will doubtless be possible to keep it in a sanitary condition. The work of cleaning and paving it so as to form a proper outfall for the surface drainage of the city is a proper charge upon the whole community. Cow Horn creek really takes the drainage of the greater part of the town, and under the state of things which we recommend, it would still be the outlet for all the surface water of the city. It should be put in a condition to discharge this water properly. To make it a covered sewer would be an expensive work, considering the very large amount of water which sometimes comes down the channel in the spring, nor is such a costly work necessary to its maintenance in a sanitary condition.

Your city engineer has, we believe, recommended that the bed of the brook should be lowered to the level of the Hudson River railroad culvert and the culvert under Church and Washington streets. This would give a better fall to the brook than it has at present; and if after being lowered the bed was paved with cobble-stones, a very small amount of work annually performed would keep it down to the adopted grade.

It is not probable, however, that Cow Horn creek can be relied upon to drain the saturated lands between Center street and the canal. It is probably not practicable to sufficiently lower the channel to accomplish this purpose. These meadow lands are wet for nearly half a mile to the west of Cow Horn creek, and the fall in the direction of this creek would not be sufficient to insure the drainage of the low land. It seems possible that there may be a manufacturing settlement in this part of the city, and some provisions must be

made for carrying off the storm water that falls on or is brought down these low lands. This can be better accomplished by draining them toward some line more central than that of Cow Horn creek. Mill creek carries much more water than Cow Horn creek. If, instead of being allowed to flow to the junction of Cow Horn creek, Mill creek was diverted near the crossing of the Delaware and Hudson Canal Company's railroad, and carried north-westward by the straightest line under the Central railroad and under the canal to the branch of the Mohawk river, this channel could be made very much lower than Cow Horn creek. This distance of Mill creek from the river in a straight line at the point mentioned is only about 1,300 feet, whereas by a course that it now follows to the river through the junction with Cow Horn creek, the distance is nearly 3,000 feet. Mill creek could, therefore, be discharged into the Mohawk by an artificial channel in the place described, much more rapidly and at a lower level than if it was allowed to join Mill creek.

Toward such an artificial channel the meadows could be drained from both directions, and they could undoubtedly be kept dry except in high water in the river. It is the opinion of the committee that the drainage of these lands cannot be properly accomplished through Cow Horn creek. Unless provision is made for the drainage of this flat tract lying between the Erie canal and Center street, and extending from near State street to the western limits of the city, the saturated condition of these grounds is liable to be a continual source of miasms that may affect the health of the whole city.

On the map accompanying this report is sketched the approximate position for an artificial outfall for Mill creek, which would answer also as an outfall for the drainage of this large tract.

Beside the construction of a proper system of sewers and the provision for the proper drainage of surface water through the cleaning of the channel of Cow Horn creek, and the proper drainage of the flats along Mill creek, we strongly recommended the securing of a pure water supply for the city. The present water supply is undoubtedly contaminated with sewage from Cow Horn creek; and even if this creek was kept in a cleanly condition, it would be unsafe to take the water supply from a point so near the outlet for the surface of the whole city. It is hard to imagine an arrangement much more dangerous than that by which the city is at present supplied with water. If water is obtained from the Mohawk, it should be taken from a point above all possible danger of pollution by the drainage of the city.

Responsibility for the Improvements. — It has been alleged that the State is responsible for the condition of Cow Horn creek. The facts heretofore stated show conclusively that the filling up of the bed of Cow Horn creek is not due to obstructions by the canal culvert, but that this process of filling is going on equally both above and below the culvert, and higher up the brook in the city, where the level is so much above that of the meadows that there can be no possible connection between the culvert and the filling. The process of filling is partly a natural one, from the washing of silt, from the banks of the creek, and partly due to the sediment washed from the city streets and the organic filth drained into the brook, and also to the tar waste from the city gas-works. So far as any one is responsible for this filling, it is doubtless the city of Schenectady, which is using the brook as an open sewer. An examination of the record shows that the lands above the canal were in a swampy condition previous to the year 1851, when the State purchased a dam which was below the canal and removed it with a view to promoting the free flow of water through the creek. Land-owners hoped that this action on the part of the State would free their land from water, and they then signed an agreement that in consideration of the State purchasing and removing this dam they would release the State from all claims from past or future damages for overflowing these lands.

The Attorney-General has examined the question, and decided that the State has no responsibility regarding Cow Horn creek outside of the blue line; and it appears from the agreement entered into between the State and the owners of the lands that they have no claim whatever against the State on account of any saturation or overflow of this tract. So long as the State takes enough material out of the canal culvert to keep the water flowing under it freely their whole duty is fulfilled as regards Cow Horn creek. The responsibility, therefore, for the putting of this stream in such condition as to provide for the prompt discharge of the surface water of the city, and its proper cleanliness belongs undoubtedly to the city of Schenectady; and the execution of such works as are necessary to provide for the drainage of the flats between Mill creek and the river is a matter with which the canal authorities have nothing to do. These works are for the benefit of the city of Schenectady, and are made necessary by the natural conditions which pertain to the topography and to the use of Cow Horn creek for the drainage

of the city. We, therefore, earnestly recommend to the city of Schenectady to proceed at once to the execution of the proper sanitary measures evidently necessary for the preservation and protection of the health of the citizens.

*Committee on drainage, sewer-
age and topography.*

{ JAMES T. GARDINER,
Chairman,
EDWARD M. MOORE,
President,
ERASTUS BROOKS,
GEORGE W. COOKE,
ALFRED L. CARROLL,
Secretary.

APPENDIX.

REPORT OF DR. ALFRED L. CARROLL.

Schenectady affords another of the many lamentable illustrations of the apparently ineradicable popular delusion that natural water-courses are the proper receptacles for sewage and house refuse of all kinds. During the last year its mortuary record has shown thirty-three deaths from diphtheria, twenty-six from typhoid fever, forty-four from diarrhoea and twenty from scarlet fever, many cases of the latter malady assuming a malignant type. With an estimated population of fifteen thousand, these disorders have caused a yearly mortality of more than eight per thousand, whereas it is generally conceded that, under ordinarily favorable sanitary conditions, the annual death-rate from the several principal zymotic diseases combined should not exceed three per thousand of the population; farther, more, when it is considered that the deaths from such diseases represent a comparatively small proportion of the actual number of cases occurring, the statistical testimony gains greater force.

To put the statement in a different light: although we have not accurate returns for past years from Schenectady, it is probably not far wrong to estimate the average annual death-rate at twenty-four per thousand, in which case over one-third of the total mortality would be attributable to four maladies which are intensified, if not directly caused, by "filth-poisoning." In addition to these, I am informed by Dr. H. C. Van Zandt, the health officer of the city, that malarial fevers are widely prevalent.

In order to trace, if possible, the ætiology of this alarming pythogenic outbreak, my first step was to provide myself with a skeleton map of the city, whereon I could mark, from the death-register, the localities and distribution of fatal cases of disease. To avoid needless complication, I have annotated only the typical examples of enteric fever and diphtheria; but it is to be remarked that the mortality from the other specified disorders followed the same general lines.

The first interesting feature of the investigation is that the earlier cases of typhoid and diphtheria were separated by such intervals of time and space (occurring on opposite sides of the railways and canal) as to render improbable the direct transportation of infection ; the second, to a similar effect, that the chronological sequence of many recorded deaths has been in the reverse direction of the flow of the streams along which they occurred. Of course, in the absence of a complete record of the intermediate non-fatal cases, these data lose much of their argumentative value ; but they are not without significance in relation to the possible local evolution of disease. A farther circumstance of considerable weight, as excluding any preconceived theory of causation, is that my preliminary mapping demonstrated a notable aggregation of filth-mortality along the narrow region between Albany street and Albany turnpike, which region is intersected by a small stream, in the condition presently to be described, which was not laid down in the original map, and of the existence of which I was therefore ignorant. Finally, another noteworthy fact, elicited from the death register, is that the mortality from the diseases in question coincides with the warmth of the season ; the infection being seemingly "frozen out" during the cold months. Wherein draught of polluted ground air or "sewer-gases" is effected by the warmed interior of houses, the evil consequences are commonly noticeable in seasons when doors and windows are closed and household fires lighted, rendering the domicile, so to speak, a large cupping apparatus to exert suction on the surrounding soil and all chance conduits of ingress for foul vapors ; but where, as in the present instance, the festering heat of summer brings the chief incidents of filth-disease, we must look to out-door influences for an explanation. And these, in Schenectady, are not far to find.

Several creeks flow through the city, passing in their meanderings under highways and houses, and bisecting thickly inhabited blocks ; and these creeks, in the most populous neighborhoods, are used as common sewers ; nearly every house along their banks having its privy perched directly over their beds, whilst those a little farther removed from the shores have conduits, sometimes of earthen pipe, sometimes simply of boards, to convey their excreta and house-waste to the same convenient destination.

Dr. Van Zandt assured me that, at the lowest computation, more than five hundred privies contributed to this unsavory defilement. Owing to the sand and debris brought down from the adjacent up-

lands by the streams, aided by the household deposits of rubbish of all sorts, the beds of these creeks have been gradually "silted up" several feet above their original channels, rendering them in ordinary times shallow, incapable of carrying away the putrescent matter cast into them, and constantly liable to local obstructions. The result is that in many places they are filled with reeking masses of filth, largely composed of human excrement, and giving forth pestiferous exhalations. At the junction of the stream which runs parallel with Albany turnpike and the Cow Horn creek, the accumulation of fecal matter was particularly objectionable at the date of my visit, on May 21st. In numerous places the channel is loosely planked over, close to, or even under habitations, forming a partially covered ditch which retards oxidation while permitting the escape of the concentrated gases of decomposition. In one house I noticed a wooden casing leading from interior privy-seats on two floors directly into this sort of boxed trench, which received besides the droppings of and drains from a number of other neighboring latrines; in a basement immediately adjoining was an open pipe to carry house-water and refrigerator-waste to the same outlet; and, close by, a rain-water cistern in the cellar had its untrapped overflow led into this indescribably foul cloaca. In addition to the actual mortality of this district, I am told that very many non-fatal cases of diphtheria have arisen, and that diarrhoeal disorders have been peculiarly prevalent. The various streams from the central and western parts of the city coalesce into a common trunk in the meadowlands on the north-east, passing through the embankments of the Delaware and Hudson and New York Central railways, and a culvert under the Erie canal. At this culvert, the silting of the channel is strikingly demonstrable, the present bed of the stream being within scarcely more than a foot below the crown of the arch. Along the more sluggish current in these flat lands, the evidences of excremental deposits are readily appreciable by sight and smell, bubbles of gas arising from the fermenting compost beneath, and any stirring of the bed or borders eliciting a sickening effluvium. This single outlet — receiving, by the way, the waste products of the gas works — bears its freight of sewage on toward its debouchure into a branch of the Mohawk river; and at a point about two-fifths of a mile below is a pumping-station to supply the city with drinking-water.

A nest of diphtheria is noticeable in the vicinity of another small stream in the eastern part of the city, and attributable to similar

excremental pollution. Beyond the city boundary, in the suburb of Rotterdam, along the lines of Albany street and Turnpike, filth diseases with great mortality are said to have prevailed, the creek there being used for the same vile purposes.

Where habitations are too remote for the above mentioned water-courses to empty their sewage therein, leaching privy-vaults and cess-pools are in vogue, in numerous instances ominously near to surface-wells which exhibit a considerable admixture of chlorides. Such wells have an average depth of about twenty-five feet, but their water level is subject to great fluctuations, as might be supposed from the sandy nature of the soil, which would readily permit soakage of deleterious matter through long distances. Forasmuch as street-numbers (and even streets) are commonly omitted from the death-certificates in Schenectady, I was unable to ascertain how closely cases of disease were connected with the use of such contaminated well-water in preference to the somewhat less objectionable public water-supply; but Dr. Van Zandt was inclined to attach importance to this mode of causation.

For some lack of specific certification of deaths, it was impossible to localize upon the map all of the recorded fatal cases of typhoid and diphtheria, my information in this respect having to be derived from private sources, and in several instances it is not certain on which side of a given street the death took place; in the majority of examples, however, the figures are approximately accurate. From these and other data relating to the distribution of sickness, obtained from the observation of local physicians, I am of opinion that whilst some cases may have been due to contamination of wells, and some, perhaps, to transference of specific infection, the vastly preponderant source of disease lies in the filth-emanations from the sewage-choked water-courses.

As regards the origin of malarial fevers, the embankments of the two railways, already mentioned, have shut off all surface drainage from the low land through which they run, except in the direction of the creek, which, in its silted condition, is insufficient to relieve the soil; and, especially in a space included between the tracks, on the south-west of the city, many acres have been converted into marsh, studded with pools of standing water. The proximity of this marshy land to the populous part of the city, and the prevalence of south-westerly winds throughout that region, seem adequate to account for a wide dissemination of the paludal miasm.

ALFRED LUDLOW CARROLL, M. D.,

Secretary and Executive Officer.



Van Slyck Island

MOHAWK RIVER

ERIE CANAL

ERIE CANAL

TROY AND SCHENECTADY R. R.

NEW YORK CENTRAL R. R.
D & H
C Co
Mill Creek

Swampy Meadows
Garfield

UNION COLLEGE

Groates Creek

Cow Horn Creek

Valley Cemetery

Old creek filled in

Typhoid Fever.....○
Diphtheria.....□

State Board of Health
MAP OF THE
CITY OF SCHENECTADY
Showing the distribution of
FATAL CASES OF DIPHTHERIA & TYPHOID FEVER
during the present year
and also
the proposed outfall of Mill Creek
for Drainage of Swampy Meadows.
1884.
Scale, 45 Rods to the Inch.
Scale of Feet

REPORT ON MALARIA AT YORKTOWN.

Early in the month of January, 1884, a petition was received from N. E. Paine, and other citizens of Yorktown, requesting the State Board of Health to make examination of Whitney swamp, in that town, with reference to the question, whether it was liable to cause malarial disease to the people living about it.

Answer was made that the matter would be investigated. On the 1st of April, Dr. F. C. Curtis was directed to examine the ground and report to this committee. His report is herewith appended:

At the special meeting of the State Board of Health, on the 23d of April, the chairman of this committee presented the report of Dr. Curtis to the Board and requested power to make further investigation as to the nature and distribution of the malarial diseases of the region. He requested that Dr. Carroll, the Secretary of the Board, should make this second examination. The Board approved of the request, and on the 5th of May, Dr. Carroll, secretary of the Board, visited Yorktown, and held a conference with the health officer and physician of the place, Dr. Strang.

Dr. Carroll reported on the character and distribution of malarial disease in the region around Whitney swamp, corroborating the views of Dr. Curtis.

From the reports of Dr. Carroll and Dr. Curtis it appears, that many houses have been built in the neighborhood of the railroad station, and that more are likely to be erected in future. It further appears, that there are saturated lands known as Whitney's swamp, and that there is at a short distance another swamp known as Underhill's swamp; that the latter is already drained with a view

to bringing the land under cultivation; but that Whitney's swamp, lying very close to a cluster of houses near the railroad station, is saturated land liable to flooding in the spring and to rapid lowering of the water by evaporation in summer; that the subsoil water in the flat immediately about the swamp is very near the surface of the ground.

There seems little doubt, that the people living about this swamp show the effects of malarial influence. While it is not possible to say that this is entirely due to the Whitney swamp, it is yet evident that the conditions which this swamp presents of fluctuating water and rank decaying vegetation are precisely the conditions which are known to be most productive of miasmatic influence.

There can be no doubt that this swamp is exerting a harmful influence on the health of the people about it, and that it should be thoroughly drained and brought under cultivation.

The committee does not consider it necessary to recite the details which are fully described in the appended report. All the facts connected with the conditions of both swamps and the medical statistics, so far as could be ascertained, are therein given, and they form the basis for the conclusions at which we have arrived. These conclusions were stated by the chairman of the committee to the full Board on May 14, and the committee were directed to make a report in accordance therewith.

*Committee on Drainage, Sewerage
and Topography.*

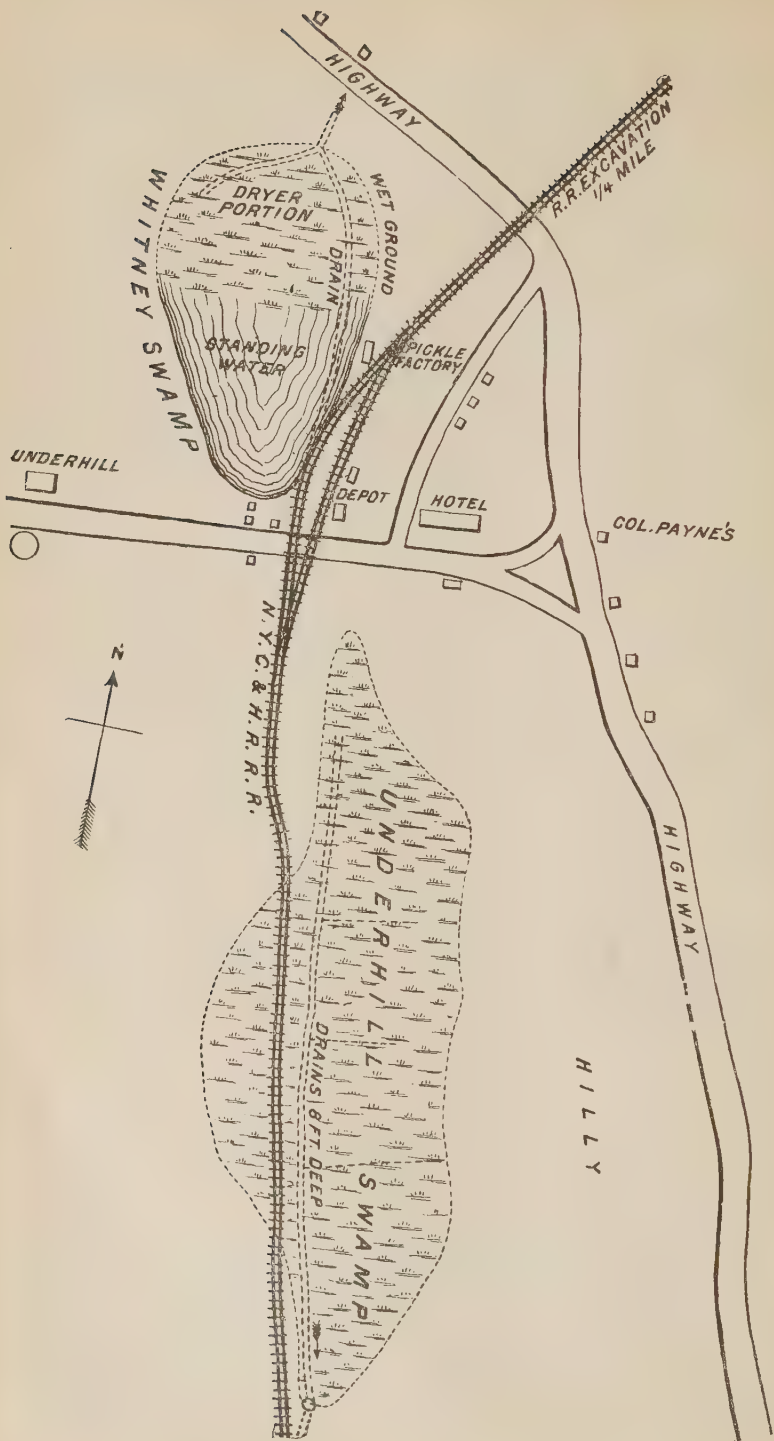
{	JAMES T. GARDINER,
	<i>Chairman,</i>
	E. M. MOORE,
	<i>President,</i>
	ERASTUS BROOKS,
	GEORGE W. COOKE,
	ALFRED L. CARROLL,
	<i>Secretary.</i>

REPORT OF DR. F. C. CURTIS.

ALBANY, April 2, 1884.

MR. JAMES T. GARDINER, *Chairman of the Committee on Drainage, Sewerage and Topography, State Board of Health:*

SIR — Under your instructions I visited yesterday the village of Yorktown, Westchester county, to inquire into the cause of the prevalence of malarial fever there, and the condition of two swamps, alleged by citizens to be the cause of it.



Yorktown is a hamlet of very recent growth, springing up since the construction of the New York City and Northern railroad, on which it is a depot of some importance. It consists of but a handful of houses, with two or three small stores, a carriage shop and other small trades, together with an hotel. It is increasing in size, most of the present population having gathered there within ten years.

The country is topographically rolling and hilly, the hills being of small altitude and cultivated. There is but little woodland. The village itself is at a lower level than the country immediately about it.

The soil is alluvial, inclined to be sandy, but nowhere purely so; neither is there clay superficially, but at one point there is a very firm hard-pan. The rock is granitic. Between this place and Peekskill, nine miles distant, I noted a number of places that were swampy, and this is characteristic of the entire region about Yorktown.

In the immediate vicinity of the village are two swamps, which are more especially the subject of this report. In a rude way the accompanying sketch will show their relation to each other and to the village.

The Underhill swamp contains about fifty acres. It is surrounded by rising ground, which is dry alluvial soil, free from timber. It is composed almost entirely of peat, and has an extreme depth of about forty feet, lying upon rock covered by a thin layer of sand. The owner, a person of wealth and intelligence, has spent much money in draining it. A few years ago the New York City and Northern railroad was constructed here, and instead of making a slight detour upon firm marginal land, it was carried across a portion of it. As you may surmise, the effect of the filling was to throw up quantities of swamp soil on either side, the gravel quickly sinking, and even a section of the road, after it was laid, going under. Not only was this new material brought to the surface, but the efferent drain was filled, and the outlet cut off. The swamp thus became saturated. Much money has since been expended to meet this evil. Piles have been sunk of sufficient length, by the aid of cribbing on top of them, to reach the bed-rock, so that the road rests now for the most part on a secure foundation, and the bulging up of swamp soil has ceased. A straight drain was dug, twelve feet deep and ten feet wide at the top, sloping to four at the bottom, along the swamp side of road through its entire extent, and although its bottom has been forced up so that the drain is not more than eight feet deep, yet it is perfectly clear and carries a rapid stream of clear brown-stained water to an efficient outlet at the southern extremity, and eventually to Croton lake. The extruded

material and most of that thrown out of the drain has been carried away to the barn-yards and made into fertilizers. The portion of the swamp outside the railroad, being perfectly dry, has been top-dressed with common earth and lime and put under cultivation, proving sufficiently fertile to yield one hundred bushels of shelled corn to the acre. The rest of the swamp is covered with bogs or hummocks of turf and a thin growth of brambles. There is hardly any other vegetation upon it. It is sufficiently dry to walk over, so that I traversed a good part of it. While the bulk of it is composed of pure peat, which, when dry, has the consistency of beeswax, and on burning leaves a residue of only six to eight per cent of ash, there is a top layer which contains an admixture of vegetable fibre, weeds, etc., which dries into a loose mass, the vegetable material not showing complete preservation. This is, however, only superficial. I am told that eyeless fish are found deep in the swamp. The bogs are being cut off now from the entire surface, and it is intended to put it under cultivation. The side drains are not clear, and the flow of water in them is slow. The surface of the swamp is, however, quite dry. Rectification of the side drains, with cultivation, will remedy every evil that may attach to this Underhill swamp.

The Whitney swamp is directly north of this and separated from it by a complete divide of stone and soil, perhaps twenty or thirty rods in extent. This swamp is about twenty-five acres in area, of oval shape, and the banks of it are less abrupt. It drains toward the north. The soil along its eastern side is water-soaked, and at the southern end was quite wet, lying low—the end where the depot and hotel and other houses stand. An obstructed drain runs its entire length along this eastern side, carrying a considerable but sluggish stream. Two-thirds of the swamp is under water, the bogs projecting above it; the northern end, in which is a branch drain, is wet, but has no standing water. There is evidence of considerable more vegetation than on the other swamp, hummocks, tall weeds and small shrubs. This was formerly covered with a growth of trees, but they have all been cut off within recent years. In the summer the swamp dries up, but is overflowed by every considerable storm. It is composed of an imperfect peat, largely admixed with vegetable material and muck. It has a depth, I am told, of about ten feet. It received some drainage from a pickle factory on its edge, leachings from cars laden with barley grains and starch waste standing about the depot, and possibly other house drainage.

The houses composing the hamlet are chiefly located about the

southern end of the Whitney swamp and to the east of that point. Quite a number are on ground but little elevated above its level; others are on rising ground to the east, and a few to the west. The main highway runs along elevated ground east of the two swamps, and a cross road runs west over the divide. Southward there are no dwellings very near the Underhill swamp. There are several farm houses not very remote to the north.

As to other possible sources of malaria, my attention was called to a small fish-pond near the residence of Mr. Underhill; this, however, is free from suspicion. There are railroad excavations not far from the hamlet, but they are through hard ground or through sand, and were made eight or ten years ago.

Dr. Strang, the local health officer, and, at present, the only medical practitioner in the neighborhood of Yorktown, states that malarial fevers are prevalent throughout that region of country; intensified, however, wherever localized pools and wet-lands exist. But inasmuch as the population of the hamlet is principally concentrated about the margin of the Whitney swamp — the surrounding marshy districts being very sparsely inhabited — the most marked evils of paludal miasm are naturally manifested there, almost every household being affected. For the past three years, or since the drainage of the Underhill swamp, these fevers have been less pronounced in character, commonly assuming the type of "masked intermittent" or chronic malarial toxæmia. In the wells on the lowland around the swamp, water is reached at an average depth of about eight feet, and shows great fluctuations of level, rising nearly to the surface in wet seasons. Even on the higher ground of the bordering acclivities the wells are shallow and with variable levels. The construction of the railway has farther impeded surface-drainage between the main part of the hamlet and the swamp, so that after rains the water for a long while stands several inches deep upon the ground. There can, apparently, be no doubt as to the character and general prevalence of the endemic disease.

I am inclined to think that the Underhill swamp was a chief factor at the commencement of the outbreak on account of the filling in of the railroad across it. The coincidence of the outbreak with the disturbance of the swamp by the railroad construction would point to this, although the swamp is peat. This disturbance has, however, ceased, a good drain carries off the water, bogs are being cut off and the material from the ditches removed. It only remains to clear the side drains to complete this and perhaps to lay

large agricultural tile in them; and finally to cultivate the surface, which has been shown to be possible, will render this swamp entirely innocuous.

The Whitney swamp is in a bad condition. It can be efficiently drained, and this should be insisted upon. There can be no doubt that this swamp is the chief factor at the present time in the malarial disease of this immediate locality.

Respectfully submitted,

F. C. CURTIS.

REPORT ON A NUISANCE AT CASTLETON, RENSSELAER COUNTY.

JAMES T. GARDINER, Esq., *Chairman of Committee on Drainage, Sewerage and Topography :*

SIR — In accordance with instructions I have examined the nuisance at Castleton, Rensselaer county, and herewith submit my report.

The particular nuisance that has been the cause of petition, on the part of the local board of health, arises from a trench or open sewer nearly in the center of North street, on the east side of River street.

The village authorities have built a three-foot brick sewer of circular form, running from the east line of River street in a westerly direction to the land of the New York Central and Hudson River Railroad Company, and the railroad company carried the same under their tracks and nearly to high-water mark of the Hudson river.

Along North street from the east line of River street, for about 143 feet, the sewer is merely an open ditch. Still further to the east a covered sewer, at first of bricks and further on of planks, has been built. During heavy rains and in spring large quantities of water flow through the sewer, while in times of drought nothing but sewage is discharged into it.

The uncovered part of the sewer is a ditch of six or seven feet in depth, choked with a rank growth of vegetation, and holding a stagnant and putrefying mass of filth and sewage from the neighboring houses.

Except in times of heavy rain this filth lies in the bottom of the ditch and slowly evaporates or sinks into the ground, while a stench is emitted that is plainly perceptible at a long distance. Light rains only serve to carry a portion of the sewage through the brick sewer and to deposit it at its mouth, thus increasing the area of exposed sewage and rendering the evil still worse.

Those living at a considerable distance from this foul ditch are seriously inconvenienced by the vile odors arising from it, while those who, unfortunately, reside in the neighboring houses, have already been troubled with malarious complaints, and would be in imminent danger should the cholera again visit us, which seems to be not only possible, but very probable.

It behooves those in authority not to neglect such foul spots among their habitations, but to take immediate action, before it is too late, and cleanse their village from such impurities.

The remedy in this case is a simple one, and the expenditure called for will be small.

The ditch should be thoroughly cleaned out, and the short piece of sewer wanting should be built in a similar manner to that already completed at both ends of the ditch. Only new and clean earth should be used for filling in over the sewer. It would be well also to extend the sewer at its mouth for about sixty or seventy feet until it reaches the low-water line of the Hudson river. The sewage would then be swept away at every tide, whereas at present heavy rains or freshets are needed to cleanse the mouth of the sewer.

Complaint has been made of bad odors arising from the rain-water openings into the sewers. By providing a larger number of openings, or by making special ventilating pipes running up to some height above the house tops, and also by providing some means of flushing the sewers in dry times, this evil would be removed.

Very respectfully yours,

HORACE ANDREWS, C. E.

ALBANY, *August 19, 1884.*

REPORT OF THE SANITARY CONDITION OF ONEONTA.

JAMES T. GARDINER, *Chairman of the Committee on Drainage, Sewerage and Topography of the New York State Board of Health:*

SIR— On September 20 I visited Oneonta in answer to the request of the president of the town board of health to the State Board.

It appears that the request had been made without any consultation with or wish of the rest of the board; and, as the president was out of town, my appearance there was an unexpected surprise to the board of health. They, however, gave me the information needed respecting the sewer, of which the following is an outline:

Last year the village trustees were authorized to raise \$10,000 by a general tax for the purpose of laying a main sewer on Main and other streets. The same was commenced at a summit on Main street and laid in both directions; one branch running easterly for about two blocks, thence southerly and westerly, emptying into the river, and was completed; the other branch running westerly and southerly along Main street for about half a mile to River street, where a deflection was made to the west for about 800 feet, with the intention of crossing land belonging to Mr. Wilcox, to empty farther down the river than the Main street bridge crossing the same. After laying pipe to this point no satisfactory arrangement could be made with Mr. Wilcox, so the same was laid easterly to Main street, at which point the money was exhausted and the pipe laying stopped about 400 feet from the river.

It will require \$600 or \$800 to complete it. Certain persons living along the line of the sewer would be pleased to connect with and use it, which accounts for the complaint to your board.

There is a depression back of the Opera House that could be drained into the sewer if it was available, and the plan was to have it condemned as a nuisance and compel the trustees to complete the

sewer in order to abate it. This sink-hole is undoubtedly a nuisance; but it can be drained for about \$100 through its natural channel, and should be done by interested parties.

It is my judgment that some other scheme may be necessary to complete the sewer. It was an error of judgment on the part of some one to commence such a sewer at the upper end, as well as to lay it up to private land before making a definite arrangement for crossing the same. As the sewer has no outlet it cannot be used, and there is little likelihood of its being soon completed by a general tax, as there is general apathy with reference to it among the citizens. I have no doubt but that the plan of sewer as laid out is a good one and should be carried out, as the village is of good size and compact, and has a water supply.

Respectfully submitted,

O. S. WILSON, *C. E.*

October 1, 1884.

REPORT ON NUISANCES AT VALATIE, COLUMBIA COUNTY, N. Y.

VALATIE, COLUMBIA COUNTY, N. Y., *August 15, 1884.*

State Board of Health :

GENTLEMEN — Inclosed please find diagram, roughly drawn, showing a nuisance which we have to contend with. If you can give us any solution of the problem you will greatly oblige.

We have no water-works and the filth from the closets has to move down by its own gravity.

The openings a. a. a. are right on the main street, in the business portion. Can any system of traps be used? A speedy answer will greatly oblige

Yours truly,

VALATIE BOARD OF HEALTH.

S. BENSON, *President.*

F. PETERSON.

L. SNIFFEN, *Secretary.*

Address — LOU SNIFFEN, *Secretary*, Valatie, N. Y.

REPORT.

To the Secretary of the State Board of Health :

SIR — I have recently examined the nuisance at Valatie, Columbia county, that has been the cause of complaint to the State Board of Health, and herewith submit my report, together with a plan of the village of Valatie.

Valatie is the largest village in the township of Kinderhook, Columbia county; it was incorporated in 1856, and according to the last census contained 1,773 inhabitants. The village is largely in-

terested in manufactures, possessing several cotton-mills, a knitting-mill and a paper-mill. The land upon which the village is located rises abruptly from Kinderhook creek, the shores of which are steep and rocky.

The outlet of Kinderhook lake unites with the Kinderhook creek nearly in the center of the village. Both Kinderhook creek and the lake outlet are considerable streams; the former has a fall of about twenty-three feet at the village and the outlet also has nearly as great a fall.

The village of Valatie has no water-supply and no system of sewerage.

A sewer has been laid in Main street, solely for carrying storm water, but the village some time ago very unadvisedly permitted the water-closets in the Kendall building and the privies of the United States Hotel to be connected with the rain-water sewer.

The sewer is a concrete pipe of about fifteen inches diameter; it runs from Main street down a lane toward the creek, discharging its contents on the rocks near the stream. The water in the creek rarely rises as high as the mouth of the sewer, which is about six feet above the low-water level.

The water-closets of the Kendall building are insufficiently flushed by water obtained from cisterns, while the hotel privies are only washed out by the slop water thrown into them, and by rain-water which is led into them from the roof. At any dry period the sewer becomes very foul and the openings in Main street, intended for the reception of rain-water, give forth very offensive smells.

The rain-water sewer is not at all adapted to receive sewage, as it is too large for proper flushing, and the numerous openings close to the sidewalks of Main street cannot fail to give forth bad smells, if the sewer is used for any thing but its legitimate purpose.

The above-mentioned nuisance, though bad enough in itself, is but trifling when compared with others in the same village. Privy vaults and cess-pools are used throughout the village. Along the banks of the creek at least forty privies, besides hog-pens and manure heaps, discharge their drainage on the shores, and but rarely into the water, of Kinderhook creek.

The stench near the creek is very offensive and is easily diffused throughout the greater part of the village by southerly winds.

A shed of the United States Hotel, standing directly on the sidewalk of Main street, is used as public urinal, and the leachings give rise to intolerable smells.

There is said to be little popular sentiment in favor of any change from the existing state of things involving pecuniary outlay, but the unsanitary condition of the village calls for immediate action.

A supply of water for flushing purposes could readily be obtained from Kinderhook creek, by means of a pump or hydraulic ram, and stored in a reservoir in the higher part of the village. The streets everywhere have considerable fall, so that no difficulty would be experienced in discharging sewers into the stream. As the water of Kinderhook creek is said not to be used for drinking purposes at any point below Valatie there would not be any objection to discharging the sewage of the village into the stream.

The existing sewers and the natural water-courses serve to carry off superfluous storm-water, hence a good system of pipes, for sewage only, flushed by water obtained as above suggested, would meet the immediate requirements of the village, which is in as bad a sanitary condition, at present, as conceivable.

HORACE ANDREWS, JR., *C. E.*

ALBANY, *September 27*, 1884.

REPORT AS TO THE CONDITION OF EIGHTEEN MILE CREEK IN NIAGARA COUNTY.

JAMES T. GARDINER, Esq., *Chairman of Committee on Drainage, Sewerage and Topography:*

SIR — Having recently received instructions from you to examine into the causes of complaint made in a petition addressed to the State Board of Health, October 20, 1884, I herewith submit the following report:

The petition was signed with many names of "inhabitants owning lands on the creek, and others living along the east branch of Eighteen-mile creek." I made an effort to select the names of such persons as were said to own lands on the creek, by inquiries in the vicinity, and could find but four such; three of these I have talked with and with a member of the household of the fourth. I have also seen two of the practicing physicians of the neighborhood and a number of the other residents.

A large number of the signers of the petition are said to live at a distance of several miles from the creek, and as they could certainly have had less reason for making complaint as to the unhealthful condition of the creek than those who lived in its vicinity, I did not converse with them.

I obtained from one of the oldest residents, and one of the owners of lands adjoining the creek, a list of the owners of all lands liable to be submerged by overflow, and it is herewith appended. As will be seen, most of these names are not attached to the petition.

A. Ward Harington,
Elizabeth Cleghorn.

Mr. Rice.

Deuel estate.

S. G. Root.

G. R. Crans.

W. R. Bronson.

Mr. Holmes.

John Skeels.

Blardnell estate.

Joseph Spingler.

William R. Pearson.

David Wilson.

J. S. Deuel.

Geo. E. Haskins.

Mrs. Geo. Thaere.

Geo. Wallace.

Reynolds Weasell.

John Holand.
Geo. W. Chaplin.
Frank B. Seeley.

Mial W. Pearce.
James Willson.
Wicks Ham.

As a result of petitions to the State Board of Health and to the Superintendent of Public Works, regarding the damage arising from floods, both to health and to property, the Superintendent is said to have given orders to entirely prevent the flow of surplus water from the Erie canal into the east branch of the Eighteen-mile creek through the gates east of Gasport.

It is the testimony of all with whom I talked, and who professed to have made any observations in relation to the matter, that there has at most times during the past summer been a considerable flow through the gates, and on November 29th, when I saw the creek, there was a large amount of water escaping at the gates so that the creek below (north of) the canal was full to its utmost capacity, though there was but a very small flow above the canal.

It was the opinion of the land-owners, as far as I could ascertain, that the condition of the creek has been decidedly improved during the last summer and at no time has there been any stagnant water in its bed, though there was one flood in dry weather during the fall which caused damage to some of the crops.

It was the unanimous opinion of the residents, an opinion which was upheld by the two physicians whom I questioned, that there has been much less sickness this last summer from malarial fevers and other malarious complaints than during former summers. These statements were so remarkably at variance with the wording of the petition that I questioned those who had signed it very closely but could find no verification of the statement regarding increase of ill health from a lack of water in the creek.

The petition further states that the land-owners whose lands need ditching positively refuse to let the inhabitants clean out the channel of the creek. I could not find any grounds whatever for this somewhat vague statement. As far as I could ascertain, the owners of the lands which have been hitherto submerged and swampy were the only inhabitants who had ever attempted very urgently to have the channel of the creek cleaned out.

In conclusion it may be said that I did not find the statements to the petition verified as a whole, nor, as far as I could tell, in any particular. Whatever the object of the petition may have been, it could hardly have been due to any fears for the public health.

I would suggest that, if the gates in the canal are to be closed wholly or in part by the canal authorities, they be kept locked, as they were formerly, so that unauthorized persons may be prevented from tampering with them. As the gates are at present they can be opened and a large area can be flooded and it will be impossible to place the responsibility where it belongs.

It would seem inadvisable in dry seasons, for sanitary reasons, to stop the flow of water entirely, but on the same grounds an amount of water great enough to flood the lowest of the lands bordering the stream should never be permitted to escape.

Very respectfully yours,

HORACE ANDREWS, JR., *C. E.*

ALBANY, Dec. 2, 1884.

N.Y. STATE BOARD OF HEALTH,
VALATIE.
SCALE 1 IN. TO 495 FT.



CLIFTON SPRINGS SANITARY REPORT, BY O. S. WILSON, C. E., SEPTEMBER, 1884 DR. W. W. ARCHER, *Complainant.*

CLIFTON SPRINGS, *August 11, 1884.*

DR. MOORE — *Dear Sir:* I send you a rude diagram of a water-course running through the center of the business portion of Clifton Springs; also crossing lots and back of dwelling-houses, as you will see by diagram. Now the trouble here is just this, you will see at D D two sewer pipes draining into this ditch, the one from Parsons' block, the other from the Clifton House. The sewer from Parsons' carries the slop water from the building, washing water, soapy water. That from the Clifton House carries all the chamber lye from a great number of boarders. It goes into this ditch contaminating this fresh water, and then empties into another open ditch of fresh water at B B, this ditch running between the dwelling-houses and within fifteen to twenty feet of their sleeping-room windows, also lying rooms. The owner of lot 4 complains to the board of health to abate the trouble; they examine the matter and decide that it is the duty of lot 4 to dam this ditch up and not let it flow across his lot. By so doing it would flood all the lands and some of the cellars adjoining. They say after he has done this it is the duty of the board of trustees of the village to change the course of the water back to the old original course, which would make a great expense. The property owners are willing that this water should flow where it does now if they will keep their slops out of it. This water was changed to the present course by the village authorities a number of years ago. You will see by the diagram that it not only carries the water of these springs, but all of the surface water of Main street. Now I contend that the board of health is wrong, and that it is their duty to cause these parties to dispose of their chamber lye and slops in some other manner, and not allow them to drain into this ditch. Will you please write me

and let me know what course the board of health should pursue, and whether I am right in the matter or not?

Yours truly,

W. W. ARCHER, M. D.,

Health Officer.

P. S. — I should have said that the stench from this ditch is very bad, and obliges the parties to keep their windows closed most of the time.

JAMES T. GARDINER, *Chairman of Committee on Drainage, Sewerage and Topography, New York State Board of Health:*

SIR — I visited Clifton Springs on 11th inst., to investigate the complaint of Dr. W. W. Archer of the local board of health, and also to ascertain if the village generally is in fair sanitary condition, and herewith submit the following report:

As will be seen by the accompanying sketch, a small spring brook flows northerly across Main street near or under the corner of Mr. Parsons' store; thence across several village lots connecting with a similar brook running easterly across Crane street, emptying into Sulphur brook on lands belonging to the sanitarium of Dr. Wm. Foster. The water in the brook is pure as it goes under Main street into a covered drain, and it comes to the surface again near the north end of Messrs. Warfield & Payne's lot. Along the covered portions connections have been made underground with several buildings to drain sink water and slops from them. These drains are used until complaint is made, then used less until all is quiet again. The main drain where covered has caved or broken in places, and should be replaced with a new one. The ditch, when open, is about three feet deep and two feet wide, and in summer carries but little water; when it is polluted it is offensive, and without doubt a nuisance.

In building the M. E. church sulphur water was found, which was conveyed along Crane street partly covered, now wholly so, emptying into the former brook.

This water adds to the odor at Crane street culvert. Dr. Foster has covered the brook across his land, and Mr. Kellogg is preparing to do the same.

I advised the village board to recommend that the brook be carried in eight-inch and ten-inch sewer pipe from above Main street to Dr. Foster's line. The village board of health were somewhat cha-

N. Y. STATE BOARD OF HEALTH.

SKETCH SHOWING THE COURSE OF A SMALL
BROOK IN THE VILLAGE OF

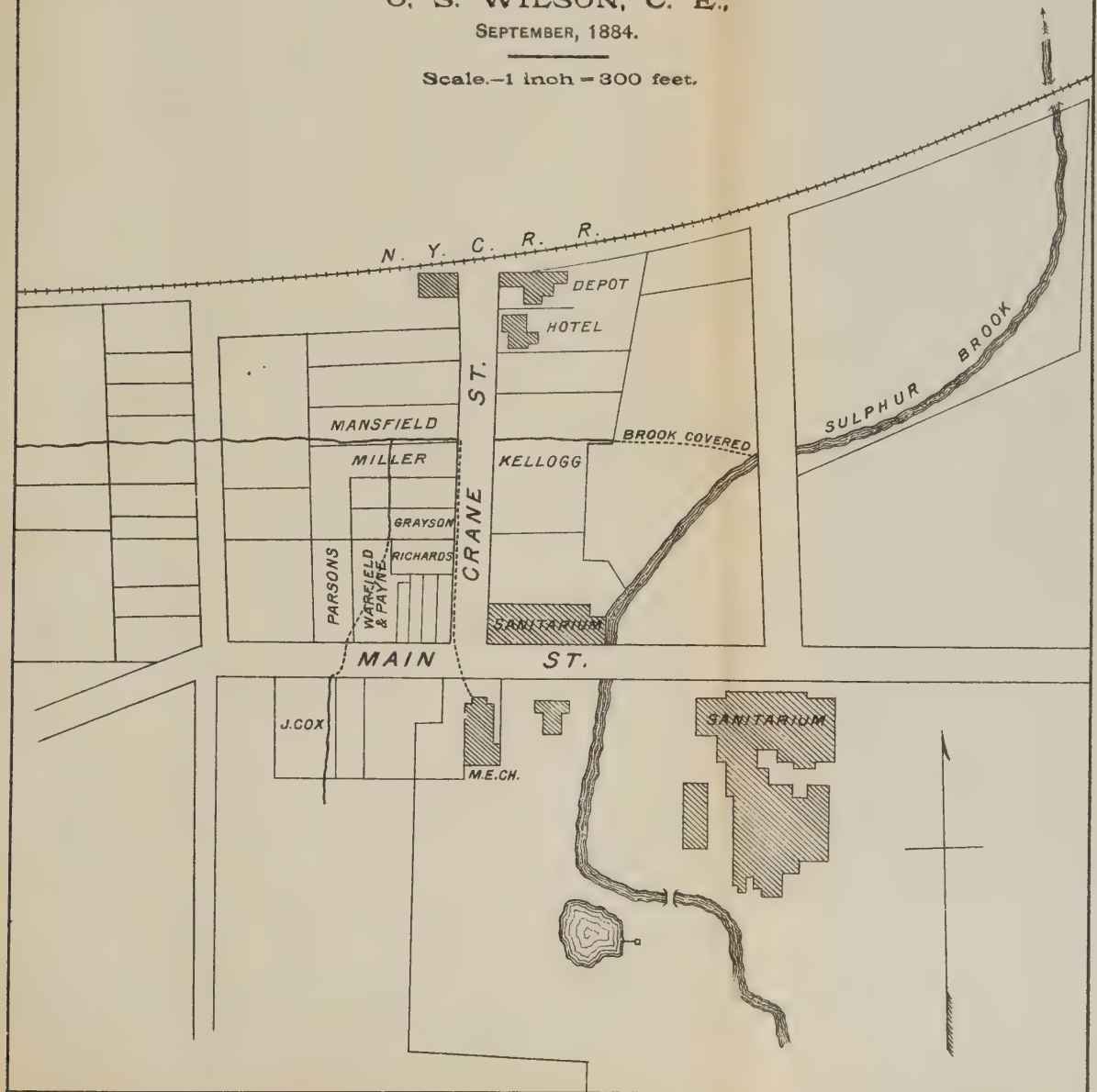
CLIFTON SPRINGS,

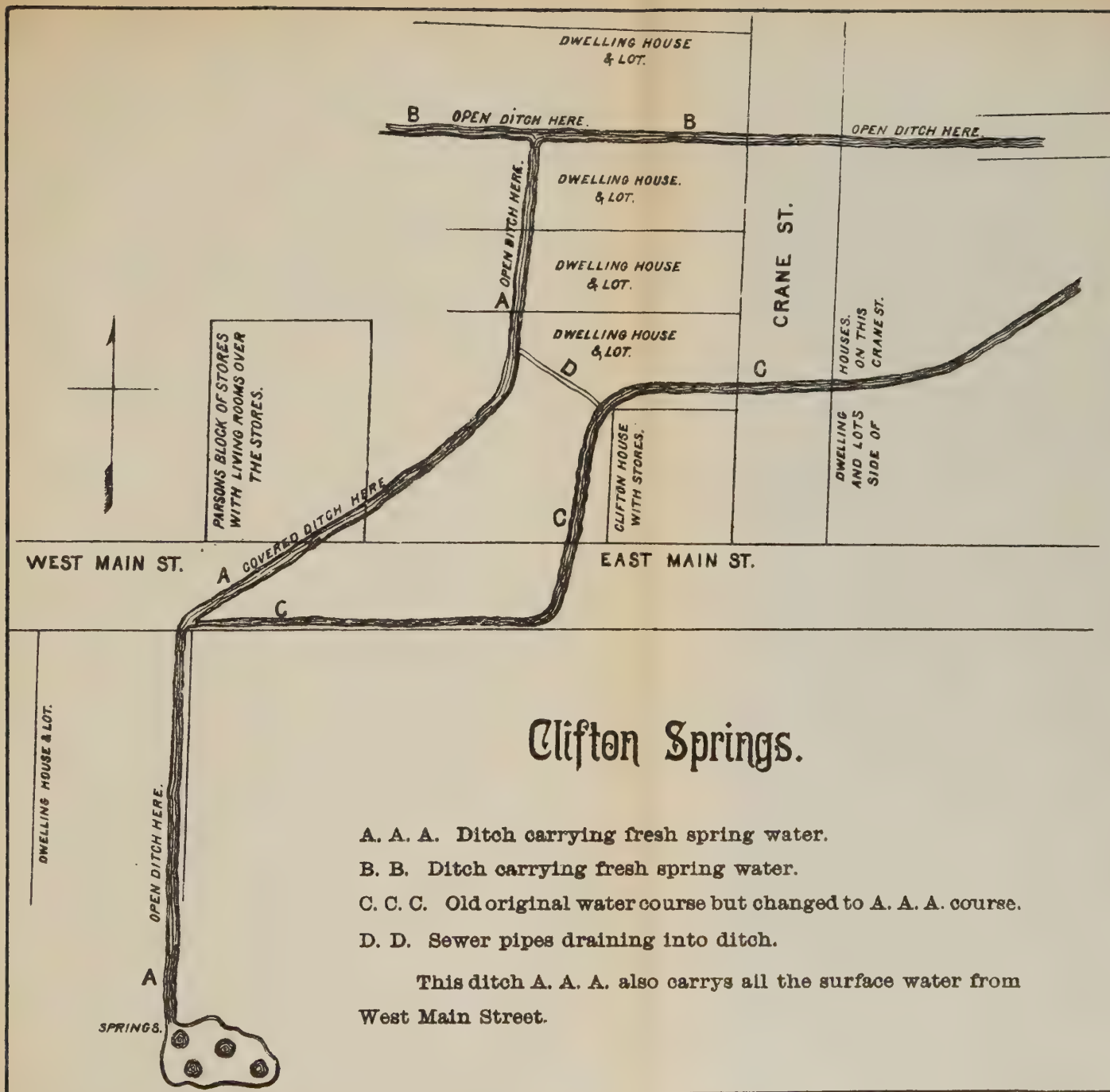
—BY—

O. S. WILSON, C. E.,

SEPTEMBER, 1884.

Scale.—1 inch = 300 feet.





grined that the State Board of Health had been called upon, while two of its members are reported to be polluting the brook, as mentioned above. They will, I have no doubt, soon attend to the brook, and put it in good sanitary condition.

I found the remainder of the village in fair condition from a sanitary standpoint.

The sanitarium, in which so many non-residents are more or less interested, has a sewer over a mile in length, with first-class connections with the same at the buildings.

Respectfully submitted,

O. S. WILSON, *C. E.*

September 30, 1884.

REPORT ON A LAW FOR THE SANITARY PROTECTION OF WATER SUPPLIES.

To the State Board of Health :

During the past year I have been called upon to visit and make sanitary inspection of the sources of water supply for the cities of Rochester, Syracuse and Ogdensburg. In each case I have found the water supply subject to more or less pollution.

The city of Rochester, for instance, is supplied from Hemlock lake, some thirty miles distant. A part of the lake and of the streams that supply it are in Livingston county, and a part in Ontario county.

Nearly one hundred cottages and hotels have been built close to the shore of the lake. Most of the buildings are located within a hundred feet of the water. The soil on which they stand is gravel underlaid by a stratum of clay. Above the clay, sub-soil water is flowing toward the lake. In many places the privy vaults are in the sub-soil water, so that their contents are dissolved and carried into the lake through the gravel which has little or no filtering power, so far as infective matter is concerned.

At one place a privy vault of this character, receiving daily during the summer season the excrement of from forty to sixty people, stands within seventy-five feet of the shore. Besides this source of contamination, several pig-styes were found close to the lake. The brook entering the lake at its southern end runs through a village some two miles south, and is there subject to pollution.

The city of Syracuse draws its water supply from Onondaga creek, along the banks of which exist nuisances of many descriptions, which, though they may not be immediately over the stream, are yet sufficiently near to seriously affect the ground waters flowing into the creek.

In Ogdensburg the ground water flowing into the river is polluted from cemeteries and habitations.

In all of the three cities the danger to the water-supply arises not from a direct contamination of the water of the stream, but from such a pollution of the ground in the immediate neighborhood of it that the sub-soil waters draining into the lakes or water channels are undoubtedly contaminated.

It is not necessary for me to say to this Board that the passage through certain soils of a very small amount of infectious matter is known to be a fruitful source of pollution of waters used for drinking purposes. An examination just made of the wells of Sandy Hill shows that the sub-soil water under that town is all polluted to a dangerous degree. The same has proved to be the case at Bath, in Steuben county, where the result was an epidemic of typhoid and so called typho-malarial fevers, affecting nearly one-tenth of the population.

During the growth of the common law in England and its modifications in this country, and in fact, when the existing statutes regarding the pollution of streams were enacted, it was supposed sufficient to protect water channels from direct and evident pollution with visible filth; but with the growth of modern knowledge respecting the origin of the zymotic diseases, proving the probable transmission of these diseases by matter having the power of indefinite self multiplication under favorable conditions, it is evident that the preservation of potable waters is an extremely difficult matter, presenting a great variety of questions in different localities which change with differences in topography, soil and underlying rock structures.

While existing laws are doubtless sufficient to prevent the throwing of animal carcasses, human excrement, or other filth directly into streams or lakes used for drinking purposes; yet these laws are not applicable and have not been found sufficient to protect such bodies of water from dangerous contamination with infectious material brought indirectly through the soil by currents of ground water.

The great difficulty in preventing contamination of potable waters

by currents of sub-soil water makes it practically impossible to enforce sanitary regulations or secure conviction for their infraction when these regulations are based upon modern ideas of sanitary precaution.

The question whether or not a given method of disposal of sewage from a dwelling or community is liable to so pollute the ground as to endanger the purity of some neighboring body of water is too difficult and too scientific in its character to be decided by any but disinterested experts equipped both with theoretical knowledge and the results of wide practical experience.

This fact has been recognized by the laws of New York, in chapter 490 of the Laws of 1883. Section 35 states "that any lake or reservoir constructed or maintained in Westchester county under the provisions of this act, shall be subject to such sanitary regulations as the State Board of Health shall prescribe."

It is my conviction, after careful consideration of this matter, that it is not possible to make general rules to be enacted as law for the protection of all water supplies; rules which will be properly applicable to the great variety of conditions which exist on the different water-sheds used for the collection of potable waters. Acts which are perfectly proper and harmless in one locality, even quite close to a reservoir, may be extremely harmful on a different surface with different soil or underlying rock structure. To make rules which would secure safety in all cases would place severe restrictions and burdens on many localities where they are entirely unnecessary. While the importance of protecting potable waters is great, it is also desirable that the rules imposed upon the people who live in the neighborhood of such waters should not be any more burdensome than are required by the circumstances of the case.

The supposed interests of the people in the neighborhood of the streams or reservoirs from which water supplies are drawn are generally directly opposed to those of the community using the waters. The farmers in the neighborhood of the lakes and streams, looking upon these as the natural drainage outlets of the district, wish to use them in an unrestricted way. The community who are dependent upon these waters for their daily supply, naturally think no restrictions too great which will insure their purity.

Both parties, being interested in opposite ways, are unfit to make rules or regulations for the protection of potable waters; and it is often the case that neither of them has at command that combination

of scientific knowledge and practical experience in such matters which would secure regulations accomplishing the desired object. The technical knowledge and the disinterestedness which are absolutely requisite to insure impartiality and effectiveness in the rules for protecting the purity of water supplies cannot be expected in local authorities.

Since, then, it does not appear possible to protect the sources of potable waters of the State, either by general enactment or by rules made by the localities interested, there remains but one way to accomplish the desired end, namely: to put upon some central and disinterested authority in the State the duty of making the regulations to protect the water of each stream, pond, lake or reservoir used as a water supply.

If State authority must, therefore, be exerted to secure proper sanitary regulation for water supplies; and if the proper regulations cannot be enacted in a general law, the State should accomplish the object by special regulations in each case. This can only be done by placing upon some department of State government the duty of making, adjusting, and enforcing such regulations.

The duty is an onerous one and not to be sought or desired by any department; but since the work is one involving special sanitary knowledge, and having for its object a sanitary purpose, and since the danger from neglecting water supplies is imminent in many localities and becoming rapidly so in others, it appears that the State Board of Health should be intrusted with this power to protect by suitable regulations the water supplies of the State. The sanitary protection of the water supply of the city of New York has already been placed under this Board by the Law of 1883. There seems no way of protecting other water supplies of the State, except to follow this precedent. For these reasons I advise that the State Board of Health recommend to the Legislature the passage of an act, the outlines of which are sketched under the following heads:

First. The State Board of Health should have power to make rules and regulations for protecting from contamination all sources of public water supply, and the infraction of these regulations should be made a misdemeanor punishable by fines not exceeding \$200 for each offense, or by a penalty of \$200, to be recovered in a civil action by the community using the water supply.

Second. Such sanitary regulations and rules after due publication should have the force of law.

Third. When the State Board of Health shall, for the protection

of a water supply, make regulations whose execution requires the providing of some public means of removal or purification of sewage, the parties benefited shall construct and maintain such works or means for sewage disposal as shall be approved by the State Board of Health.

Fourth. The community interested in the preservation of the purity of the water supply should have the power to make such inspections as are necessary to secure the water supply from any defilement and to ascertain whether or not the rules and regulations made by the State Board are complied with.

Fifth. Notice should be given by the community using the water to any parties violating the regulations of the State Board of Health.

Sixth. If the parties so notified do not immediately comply with the regulations, complaint of such fact shall be made to the State Board of Health.

Seventh. The State Board of Health shall examine the case, and if the party is actually found violating the regulations, the Secretary of the State Board Health shall notify the local board of health having jurisdiction to convene and enforce obedience to the regulations.

Eighth. In case any local board fails to enforce the order of the Secretary of the State Board of Health within ten days, the community interested in the sanitary protection of the water may proceed against the party; all proceedings being in the same legal jurisdiction as the village or city using the water.

Very respectfully submitted,

JAMES T. GARDINER,

Chairman of Committee on Drainage, Sewerage and Topography.

ACTION OF THE STATE BOARD OF HEALTH.

At the quarterly meeting of the State Board of Health on the 11th instant the above report was submitted and the following action taken:

WHEREAS, The State Board of Health is convinced that the present statutes do not provide for the effective protection of the potable water supplies of the State; and

WHEREAS, It is not possible to enact in the form of a general law such rules and regulations as will protect these waters without mak-

ing such regulations unnecessarily burdensome in many localities, therefore,

Resolved, That this Board approves the policy of having special regulations made by the State Board of Health to suit the circumstances of each case for the protection of potable water supplies, and recommends to the Legislature the amendment of the present laws so as to provide for the accomplishment of this purpose substantially as recommended in the report of the chairman of the committee on drainage, sewerage and topography.

Resolved, That the matter be referred to a special committee to prepare such act or amendment of an act as in its judgment will be considered best.

ALFRED L. CARROLL, M. D.,

Secretary.

REPORT OF SPECIAL COMMITTEE ON THE LAW FOR THE SANITARY PROTECTION OF WATER SUP- PLIES.

In accordance with the resolution of the Board we have prepared an act embodying the policy recommended by Director James T. Gardiner and approved by the Board. The act is herewith submitted.

JAMES T. GARDINER,

Chairman.

ERASTUS BROOKS,

DENIS O'BRIEN,

Attorney-General.

AN ACT

To confer upon the State Board of Health power to protect from contamination, by suitable regulations, the water supplies of the State and their sources.

The People of the State of New York, represented in Senate and Assembly, do enact as follows :

SECTION 1. The State Board of Health is hereby authorized and empowered to make rules and regulations for protecting from contamination any and all public supplies of potable waters and their sources within this State.

§ 2. The said State Board of Health shall also have power, and it shall be its duty : 1. To publish once a week, for at least six consecutive weeks, all such rules and regulations as it shall have made concerning the contamination of any sub-soil waters, springs, streams, lakes, ponds, reservoirs, or other bodies of water contributing to the potable water supply of any municipality within this State, such publication to be made in one or more newspapers published in the county in which the waters affected by such regulations are located. The cost of publishing the regulations of the State Board of Health as above provided, shall be paid by the corporation or municipality benefited by the protection of the water supply, concerning which the rules are made. 2. To impose penalties for the violation of, or the non-compliance with their rules and regulations, not exceeding two hundred dollars in any one case.

§ 3. The officer or board having by law the management and control of the potable water supply of any municipality, in all cases where the said municipality derives its water supply in whole or in part from any sub-soil waters, springs, streams, lakes, ponds, reservoirs, or other waters concerning which the State Board of Health shall make any rule or regulation, is hereby authorized and empowered to make or cause to be made such inspection of the sources of said water supply as said officer or board may deem advisable to secure the said water supply from any defilement, and to ascertain whether or not the rules and regulations made by the State Board of Health are complied with.

§ 4. In case such inspection shall disclose the violation by any person or persons of any of the rules or regulations of the said State Board of Health relating to the sources of said water supply, the officer or board mentioned in section three of this act shall serve or cause to be served a copy of the said rules and regulations, accompanied by a notice specifying the rule or regulation claimed to have been violated, upon the said person or persons violating such rules or regulations. If the person or persons so served do not immediately comply with the said regulation, the said officer or board having charge of the water supply of the municipality affected thereby shall notify the State Board of Health of the violation of its rules ; the State Board of Health shall thereupon examine into the said violation, and if the party complained of is found to have actually violated any of the said regulations, the Secretary of the State Board of Health shall notify the local board of health having jurisdiction thereof to convene and enforce obedience to the said regulation.

§ 5. In case any local board of health having jurisdiction thereof fails to enforce the order of the Secretary of the State Board of Health within ten days after the receipt of a notification so to do, as provided in the last section, the corporation furnishing the water supply, or the municipality deriving its water supply from the waters for the sanitary protection of which such rules have been made, is hereby authorized and empowered to maintain an action in a court of record against the person or persons violating the said rules for recovery of the penalty therein provided.

§ 6. Every person who shall willfully violate or refuse to obey any rule or regulation made and published by the State Board of Health, pursuant to the provisions of this act, shall be guilty of a misdemeanor, and on a conviction thereof shall be subject to a fine or imprisonment, or both, at the discretion of the court, such fine not to exceed three hundred dollars, nor such imprisonment six months. But the recovery of a penalty in a civil action, as provided in section five of this act, and criminal prosecution and conviction under the provisions of this section, shall not be had for the same offense.

§ 7. When the State Board of Health shall, for the protection of a water supply from contamination, make regulations, the execution of which will require the providing of some public means of removal or purification of sewage, the municipality or corporation owning the water-works benefited thereby shall, at its own expense, construct and maintain such works or means for sewage disposal, as shall be approved by the State Board of Health.

§ 8. The State Board of Health, any local board of health, or any municipality or corporation furnishing water, may cause the affidavit of the printer, publisher, or proprietor of any newspaper publishing the rules and regulations as provided by the second section of this act, to be filed with such rules as published in the clerk's office of the county in which the municipality or corporation furnishing the water supply in any case may be situated or located, and such affidavit and rules, or duly certified copies thereof, shall be deemed conclusive evidence of due publication and of all the facts therein stated in all courts and in all proceedings or prosecutions under the provisions of this act.

§ 9. All acts or parts of acts inconsistent with the provisions of this act are hereby repealed.

§ 10. This act shall take effect immediately.

REPORT.

ALBANY, *February 4*, 1885.

To Hon. HENRY FLOOD, *Mayor of Elmira*, Hon. J. S. VAN DUZER,
Member of Assembly, Hon. N. R. SULEY, and others.

GENTLEMEN — In July last your petition was received by the State Board of Health requesting the board to examine that part of the old canal which is above the Elmira city limits, where it is alleged a serious nuisance exists which ought to be abated. The board was requested to advise a plan for remedying the evil.

The matter was referred to the Committee on Drainage, Sewerage and Topography, and by order of the Chairman of the Committee, Director James T. Gardiner, Mr. O. S. Wilson, an engineer of the board, was sent to examine the locality complained of. His report and maps were laid before the State Board at the September meeting; and the State Board requested Director Gardiner to personally examine the case and report thereon in its behalf, directly to the petitioners.

In accordance with this resolution Director Gardiner visited Elmira in company with Mr. Wilson, and after examining the ground, submits the following

REPORT.

The petition refers only to the condition of the abandoned Chemung canal north of the Elmira city line; but the question of the drainage of this part of the canal and of the unsanitary influence which it is exerting is closely connected with the condition of that part of the canal prism lying inside the city line, and also with the water levels in Newtown creek.

An important part of the city of Elmira lies upon the northern

bank of the Chemung river, on a flat valley terrace, bounded on the east by Newtown creek and on the west by the abandoned canal and the line of the Erie railroad.

The surface of this part of the city slopes southward to the Chemung river, but the fall of the ground is slight. Near the river the average elevation of the surface is about fourteen feet above the sewer outlet or fifteen feet above low-water mark. A mile and a half north of this on the city boundary, in the neighborhood of the abandoned canal, the surface elevations are only about nineteen feet.

The remarkable flatness of this part of the city makes drainage a matter of more than usual difficulty. The soil is gravelly, so that the subsoil waters would drain off readily were the proper outfall available. Where sewers have been constructed there are no difficulties complained of as regards either sewerage or drainage, the sewer pipe being laid so as to permit the entry of subsoil water at the joints; but owing to the very slight fall of the ground the sewer system of Elmira cannot be extended over the lower parts of the northern section of the city. That part which lies along Lake street, and for two blocks to the west of it can undoubtedly be sewered by an extension of the present system; but along Sullivan street, beyond Washington avenue, and along the old canal north of Washington avenue, the ground is too low to be properly underdrained by sewers connected with the present system.

The health of Elmira is threatened from three causes, differing somewhat from each other, but all more or less connected.

In the northern part of the city the ground water is so high that damp cellars and damp soil surrounding the dwellings for many months of the year are the rule rather than the exception. This soil saturation of the lowlands in the neighborhood of Newtown creek and the canal, a saturation which really extends over the whole of the northern part of the city with the exception of a narrow strip in the neighborhood of Lake street, is most prejudicial to health, producing as it does consumption, rheumatism, malarial fevers, and kindred diseases. That the saturation of the soil with water more or less polluted from human dwellings is very prejudicial to health has been thoroughly demonstrated by experience in England, where careful statistics regarding the health of the people were an official matter of record before the introduction of sewerage and drains. One effect of sub-soil drainage in the town of Salisbury in England was to reduce the deaths from consumption forty-nine

per cent, in other places the reduction varied from twenty to forty-seven per cent.

Doctor Bowditch's investigations as to the cause and distribution of consumption in the State of Massachusetts, led him to the conclusion that moisture in the soil about dwellings was the most important cause in the propagation of consumption. In certain towns of Massachusetts, where a part of the inhabited district is thoroughly underdrained and a part is on saturated soil, it was found that in proportion to the inhabitants, there were three times as many cases of consumption on the saturated soil as there were on that which was underdrained.

While consumption is in many places the most fatal disease produced by soil saturation, malarial difficulties and rheumatism are rife on damp grounds. In general, the whole northern part of the city of Elmira is, I believe, less healthful than it would be were the ground water materially lowered.

The natural drainage outfall of the subsoil waters of this district is Newtown creek; but owing to the existence of two dams, one near Water street and one near Fifth street, the water of Newtown creek is raised and backed up to a point considerably north of the city limits. Mr. Wilson's surveys show that the surface waters of this district north of the city cannot now satisfactorily be drained into Newtown creek owing to the small difference of level between the water in the creek and the water in the canal prism and Lake Eldredge. The water in the canal opposite General Diven's is only three and four-tenths feet higher than that in Newtown creek at low water, and the distance from the canal to the creek is 2,400 feet.

The prism of the abandoned canal north of the city line has been cut into several pools by the crossing and recrossing of the railroad which follows the line of the canal and by the streets which cross it. The water in the old canal is stagnant, and for half a mile above the city line it is grossly polluted with filth. There can be no question that the condition of this canal prism is dangerous to the health of all susceptible people exposed to its influence, and that it is a nuisance of great magnitude. The condition of the canal bed becomes worse and worse as the city is approached, and it is much fouler within the city limits than to the north of it.

Just above the city line the sewer from the State Reformatory enters the canal bed, and is laid along the open bed to within 800 feet of Washington avenue, the bottom of the sewer being higher

than the deepest part of the canal. This sewer is made of concrete pipe with uncemented joints and the sewer not being covered with earth, is broken in many places by the action of the weather. From out of the joints and the breaks in the sewer streams of sewage are flowing into the abandoned canal prism, which from this cause has become an elongated cess-pool. The State sewer pouring its filth through open joints and cracks into the canal prism is a most serious nuisance, and doubtless endangers the health of all those who are exposed to its miasms. The State Reformatory, on account of the condition of its sewer, is maintaining a nuisance endangering the lives of the people of Elmira and of passengers on the trains which pass over three railroads along the banks of this canal.

The three causes, therefore, threatening the health of the northern part of the city of Elmira are: the high-ground water of the city and the district to the north of it; the undrained canal prism outside of the city limits; and the condition of the canal prism within the city, filled with stagnant water grossly polluted by sewage from the State Reformatory and from the work-shops in the vicinity.

While all the water in the canal prism from Washington avenue to Gipsy lane, a distance of a mile and a half, is stagnant, yet the southern half of this stagnant water is so foul with sewage that it may be said that there is along the northern borders of Elmira a cess-pool three-fourths of a mile long. For this foul condition the State Reformatory sewer is partially responsible; but dwellings and work-shops are also draining their sewage into this old canal.

REMEDIES.

The remedy for the high-ground water suggested in Mr. Wilson's report seems the only one practicable. So long as the dams keep the water high in Newtown creek the subsoil waters cannot be drained off, nor can the waters of Eldredge lake or those collecting in the northern part of the canal prism find proper outlets. In order to free the northern part of Elmira and the districts immediately north of it from all those dangers which come from saturation of the soil it will undoubtedly be necessary to remove the dams from Newtown creek and so deepen and straighten the channel of that stream as to make an outfall for the surface and subsoil waters low enough to provide for their speedy drainage. But this alone will not be sufficient to prevent the accumulation of water in the bed of the abandoned canal. There appears to be no way of pre-

venting water from settling and stagnating in this channel except to fill the old canal with earth. This canal is not the property of the State, but is owned or controlled by the Elmira, Cortland & Northern R. R. Co., by whom it is partially occupied. There appears to be no good reason why this railroad company should be allowed to maintain a nuisance on their property as they now are doing.

That part of the canal prism which is within the city of Elmira is in dispute between the city and the railroad company; here the worst part of the nuisance exists and it cannot be abated without filling the canal prism. Since however the ownership of this part of the canal cannot be determined except by legal decision, and since the public health is endangered by the existence of such a body of grossly polluted water, it is recommended that the city fill the canal bed as a sanitary measure requiring payment from the railroad company thereafter should the property be found to belong to them.

Along the canal the Reformatory sewer, which belongs to the State, is a nuisance, and the State Reformatory should be required to build a new and proper sewer, the line of which should follow some public street, and the sewer be so placed that it can be covered with at least three feet of earth. The present sewer, standing as it does above the ground, its filthy waters leaking into the soil and the canal prism, and its foul emanations contaminating the surrounding air, should not be permitted to continue for another year. Owing to the lowness of the ground along the line of the canal, it will not be possible to build a sewer which will drain the canal prism, it must, therefore, be filled up. A detailed description of the condition of the canal will be found in Mr. Wilson's report hereto appended.

RECOMMENDATIONS.

In view of the foregoing facts, it is recommended, that outfall for the drainage of subsoil and surface waters in the northern part of Elmira and the adjacent district be provided for, by removing the dams and deepening the channel of Newtown creek; that the railroad company be required to fill the prism of the abandoned canal between the north boundary of the city of Elmira and Gypsy lane; that the prism of the canal within the city limits be filled up by the city, and the costs assessed upon the owners of the property, and that the State Reformatory proceed as soon as possible to construct a tight sewer covered with no less than three feet of

earth, the same being built on public property where it will always be accessible for repair.

Very respectfully yours,

For the State Board of Health,

JAMES T. GARDINER,

*Chairman of the Committee on Drainage, Sewerage and
Topography.*

NEW YORK STATE BOARD OF HEALTH.

PLAN FOR DRAINAGE OF THE CHEMUNG CANAL PRISM, NEAR THE CITY OF ELMIRA,

MADE BY

O. S. WILSON, C. E., JULY, 1884.

JAMES T. GARDINER, *Chairman of Committee on Drainage, Sewerage and Topography.*

SIR — In accordance with your instructions, I investigated the condition of the abandoned Chemung canal near Elmira, and submit the following statement of its condition, from a sanitary standpoint; and a general plan for the abatement of the nuisance now existing there. I inclose two tracings, one showing this portion of the canal and its immediate surroundings; the other for the purpose of showing the general topographical surface of the land between the canal and Newtown creek in the city of Elmira. I have put the elevation on the streets, using as a datum the sewer outlet of the city or about mean low water in the Chemung river. I am informed that mean low water in the river is about one foot lower than the sewer outlet, but for the purpose intended the elevations are sufficiently exact and are relatively correct.

As will be seen from this latter map there is a low ridge between the canal and creek; also that there are two dams in said creek, one near its mouth, the other about one and one-half miles farther north near East avenue. At this northern dam there is a fall in the creek surface of five feet. The dam is owned by a company operating a woolen mill (now closed), and in July backed water above the outlet of Park lake, nearly to Mr. Diven's bridge over the creek.

A few years since the Canal Railroad Company bought the canal,

from Horseheads to Elmira, of the State and built a single track road along the tow-path most of the way. Said railroad is now controlled by the Elmira, Cortland and Northern Railroad Company. Before the railroad bought the canal the city of Elmira filled a portion of it, now called State street. A sewer was laid in said street to Washington avenue or a little above. This sewer at Washington avenue is the datum of levels given on the first mentioned map and is eleven (11) feet above sewer outlet. When constructing the railroad the canal was crossed twice near the Old Ladies Home above Grand Central avenue, a sewer pipe was laid under the road-bed at these crossings; but, owing to the depth of mud at this point, the road settled, carrying said pipe down and now there is seemingly no connection at either crossing through the pipe for water. As a consequence the water in the canal bed is better above than below, where it has been so vilely polluted. Above where Gypsy lane crosses the canal there was a lock, the last but one in the canal going south. North of this lock, in which are copious springs, the bed of the canal is dry in summer.

Along the south side of the driving park flows the outlet of the lake in Eldredge park. It formerly passed under the canal in a box culvert, the railroad crossing the culvert crushed it, stopping the flow of water through it; the lake outlet was then turned into the canal. Opposite Mr. Diven's ditch there are two small pipe culverts under the railroad, which are too high and too small to draw the water in the canal much lower than at present.

The lake outlet originally followed a tortuous course, about where indicated by dotted line on map, after crossing under the canal. Mr. A. S. Diven, at his own expense, dug a ditch straightening the channel through his land as far as the lane; below there the water flows through its original channel. Mr. Diven utilized a bend of this outlet in his grounds for a fish pond, and is now willing and ready to take the water from the lock above Gypsy lane, to his pond, in pipe laid about as shown on the map. Park lake is deep and evidently supplied mostly below the surface, as more water flows from than into it on the surface. There is evidently a natural depression in this vicinity, as when the New York, Lackawanna and Western railroad was constructed across the park east of the lake, it was necessary to build a trestle, some of the piles being driven forty feet. In the road opposite the bed settles every year. The line marked "bottom of mud" in the canal profile also shows something of this basin or depression. The pool above Grand Central

avenue, and all below, going southerly, are connected by culverts through the railroad and street crossings. These culverts are also too high and too small for drawing the water down, even if there was sufficient grade. The water in this last mentioned section or pond is stagnant, and has been polluted mostly by the Reformatory sewer.

I was informed that until within a few years the sewage from the Reformatory was brought down in a wooden box sewer and emptied into the canal, which while in operation carried the most of it off into the river. About three years ago a cement sewer pipe was laid from the city sewer near Washington avenue, northerly along the canal bottom to a point near the park ; said sewer, having a grade of about one foot in a thousand, is west of the center of the canal prism, is covered for a short distance at the south end (see profile), and half covered or wholly exposed the remainder of the distance along the canal. It is covered from the canal toward the Reformatory about three-fourths of a mile distant.

This sewer at present leaks at various points, the sewage spreads over the ground and into the water, creating a vile stench, which is so bad at times as to sicken passengers riding by on the cars ; I shall not endeavor to describe the situation in its disgusting details, as I am unable to do the subject justice ; but it is a sad commentary on our boasted civilization that such a needless nuisance should be tolerated anywhere, to say nothing of a city the size of Elmira, allowing it within its limits. The sewer should never have been laid in the canal at all, as there exists no necessity of so doing. It could have been laid alongside in the bank west of the canal, and covered four feet or more. Fortunately there are few people living close to the canal ; still there are hundreds of men employed, in the furnaces, on the railroads and about in the vicinity, whose health and lives are endangered daily by breathing the poisoned air.

The surface of the northern long level in the canal is but 3.4 feet above the surface of the water in Newtown creek opposite, and as the creek is the natural and most feasible outlet for drainage purposes over the area under consideration, it is evident that more fall must be provided in the creek.

PROPOSED PLAN.

I would suggest that both the dams in Newtown creek be purchased and taken out of the stream, and that said creek be cleared of obstructions, deepened, straightened and converted into a drainage

ditch for this part of the city. What the expense attending this will be, I have no data for calculating. It is, in my judgment, the only way to properly do the work. The benefits to the city in enhanced value of real estate would warrant the expenditure of ten times the amount that would be required, to say nothing of the beneficial sanitary results. With such an outlet it will be a simple matter to deepen Mr. Diven's ditch, and draw the water from the upper end of the canal. Where the lake outlet crosses the canal bed it will be necessary to lay pipe, or otherwise confine the water while crossing the canal. When these improvements are made, the canal prism can be filled with earth.

At the southern end of this canal I recommend that the Reformatory sewer be taken out of the canal and the same filled with earth. As the sewer needs relaying I would suggest that it be laid west of the canal in a trench, and covered as deeply as possible, rather than to cover it where it lies in the canal.

The Elmira, Cortland and Northern railroad now control the canal, and should be required to fill it.

I have estimated that to fill the canal four and one-half feet deep from above Washington avenue to Gypsy lane will require 140,000 cubic yards of earth, which could be brought in by rail for about ten cents per cubic yard, or \$14,000 for the filling; add to this \$1,000 for grading, etc., makes \$15,000 for the whole estimated cost of filling the canal.

For deepening Mr. Diven's ditch, and providing and laying pipe for the lake outlet across the canal bed and railroad, about \$1,500 would be needed.

So far as this canal is concerned the removal of the upper dam would give sufficient fall.

I have aimed to show the source and extent of existing evils, and to submit a general plan by which they can be remedied and the sanitary condition of this region improved.

August 7, 1884.

Respectfully submitted,

O. S. WILSON,
Civil Engineer.

NEW YORK STATE BOARD OF HEALTH

MAP

OF A PORTION OF THE

CITY OF ELMIRA,

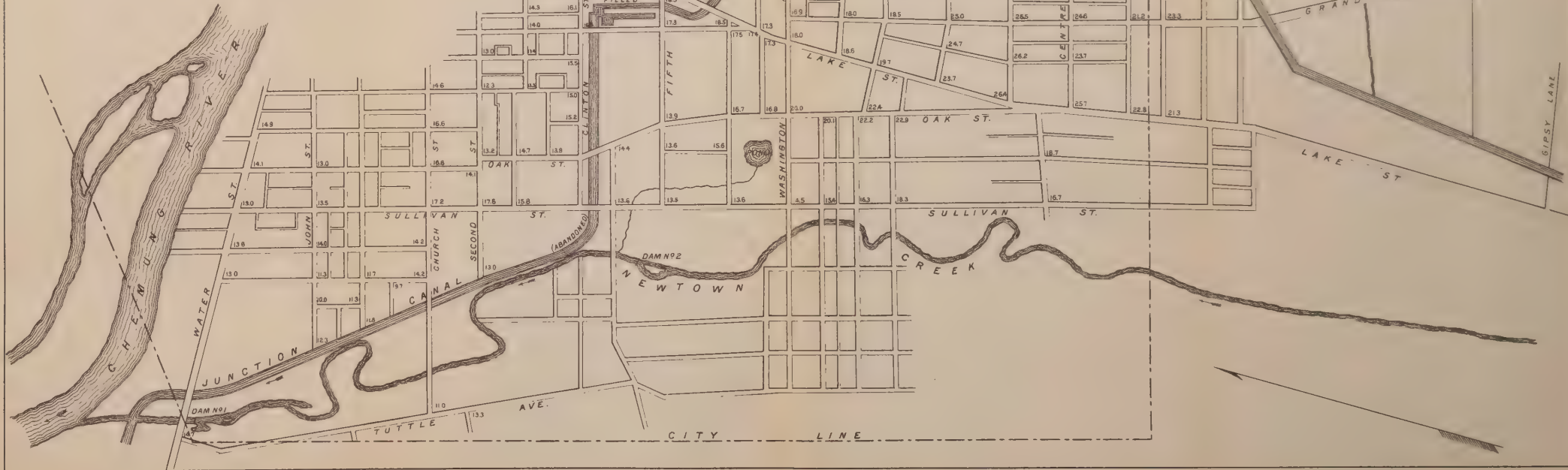
SHOWING STREETS AND ELEVATIONS,
TO ACCOMPANY

A PLAN FOR DRAINING THE CHEMUNG CANAL PRISM,

IN THE NORTHERN PART OF THE CITY.

Made by O. S. WILSON, C. E.

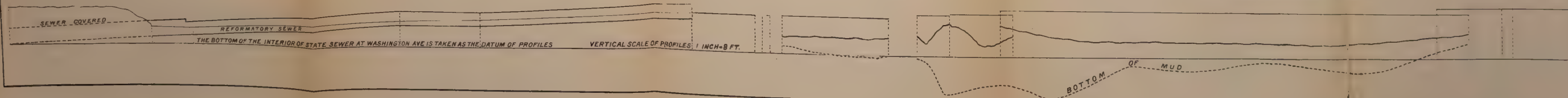
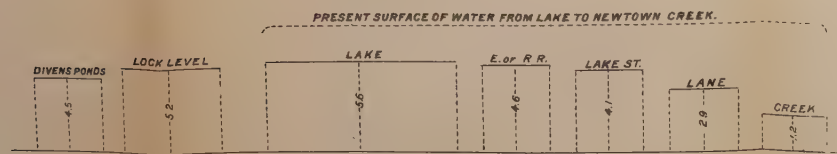
Scale—1 inch = 1000 feet.





NEW YORK STATE BOARD OF HEALTH.
 Plan for Drainage of Chemung Canal Prism
 NEAR THE CITY OF ELMIRA.

MADE BY
O. S. WILSON, C. E.
 July, 1884.
 400 Feet—1 inch.





REPORT ON THE SANITARY CONDITION OF HAVANA.

To the State Board of Health :

Complaint having been made that the undrained prism of the abandoned Chemung canal, in the village of Havana, was a nuisance causing much sickness, Mr. O. S. Wilson, civil engineer in the service of the Board, was sent to examine the sanitary condition of the village, and report what measures if any, were necessary to remedy the evils complained of.

Mr. Wilson's excellent report, which is herewith appended, shows that there is an excessive number of cases of zymotic disease in Havana, and he carefully points out several causes which are contributing to produce this result. Some of them, it is clearly the duty of the local board of health to remedy without delay.

We strongly commend the advice of Mr. Wilson to the local board of health, and advise that they cannot proceed too soon to abate the local nuisances, which he describes, and which come within their jurisdiction.

In addition to these however, the undrained prism of the canal, the greater part of which belongs to the State, is doubtless a nuisance injurious to the health of Havana, passing as it does through the settled part of the village. Attempts have been made to drain this by an open ditch down the center of the canal; but the experience of this Board during the past few years goes to show that such open ditches are not effective where the fall is very slight and

the growth of vegetation rapid. Certainly the attempt to drain the Chemung canal at Havana by this means has been a failure, and Mr. Wilson suggests a plan for drainage, substantially like that which was approved by this Board for the drainage of the canal at Horseheads last year, and which has been remarkably successful in its workings.

Mr. Wilson estimates the cost of this work at \$6,200. It should certainly be executed for this sum. The committee recommend to the Board, to declare the condition of the abandoned Chemung canal in Havana a nuisance, dangerous to the public health, and advise that the Board recommend to the legislature the making of an appropriation for its sanitary drainage, substantially as set forth in Mr. Wilson's report, since it appears that the canal is in greater part the property of the State.

Committee on Drainage and Sewerage.	{	JAMES T. GARDINER, <i>Chairman,</i>
		ERASTUS BROOKS,
		GEORGE W. COOKE, M. D.,
		EDWARD M. MOORE, M. D.,
		ALFRED L. CARROLL, M. D., <i>Secretary.</i>

At a meeting of the State Board of Health on the 17th of February, the above report was submitted, and on motion adopted and ordered transmitted to the legislature, and to the health authorities of Havana.

ALFRED L. CARROLL, M. D.,
Secretary.

SANITARY REPORT ON THE VILLAGE OF HAVANA.

By O. S. Wilson, C. E., Jan. 1885.

JAMES T. GARDINER, ESQ., *Chairman of the Committee on drainage, sewerage and topography of the New York State Board of Health :*

SIR — In accordance with your instructions, I investigated the Havana complaint, and herewith submit the following report :

Havana is an old settlement about four miles south of Seneca lake. It was in an early day practically at the head of navigation on the lake, and was a live, flourishing village before the days of railroads, drawing trade from the section of country about Elmira and from northern Pennsylvania. The abandonment of the Chemung canal was the death-blow to its prosperity. It is now on the decline, showing evidences of decay, and unlike most American towns, enjoying as many present facilities, points to its empty and decaying foundries and shops, and to the names of prominent men who have lived and prospered there, rather with the pride of what it has been, than with any cheerful prospects as to what it may become. Its population now is about 1,500. It is at the head of the bottom land which spreads out to the north into a marsh containing about 3,000 acres.

A generation ago this marsh was mostly covered with a stunted growth of trees and brush, which has been cut off. The lake is gradually receding and the land is being ditched around the margin of this marsh and drained for agricultural purposes. As to the effect of this marsh on the healthfulness of Havana, it is in my judgment, of secondary importance to the more immediate surroundings. It is also very difficult to remedy without a large out-

lay of money, until by some means Seneca lake can be lowered a few feet. Several attempts have been made to effect this, but so far without success. This matter is of vital importance to Watkins; much more so than to Havana, as during the summer season north winds are exceptional.

The general elevation of the village above the lake is from ten to twenty feet. Catharine creek runs through and about parallel with the canal prism. Several tributaries enter the creek within the corporation (see map).

WATER SUPPLY.

Drinking water is obtained from wells, most of which are driven.

The soil is loam and gravel for a depth of twelve to twenty feet; below this lies a bed of hard blue clay, about forty feet in thickness; most of the wells are driven through this clay, where water is found which rises to within a few feet of the surface, in some cases flowing over the top of the pipe. These deep wells are free from surface filth and afford good water. The dug and shallow wells should be abandoned for culinary purposes, especially at hotels and houses where transient summer health-seekers are entertained. I am informed there are several such instances where numbers of such people are guests during the season.

PRESENT SANITARY CONDITION.

By referring to the profile given, it will be seen that the water in the creek, which is now unusually low for this season, is higher than the canal-bed through part of the village. As a result, there is water in the canal. It does not come in in quantity sufficient to produce a perceptible stream, but forms a stagnant pool, which, in summer, is filled with aquatic vegetation. From South street north a ditch about three feet wide and a foot or two deep was dug along the center of the canal—most of the way—which, in dry weather, carries off the water along its course. This ditch was dug by the direction of the health officer, several years ago. It has a very slight grade; the water flows slowly, and it gradually fills up with silt and vegetation. It is in fair order now, having been recently partially cleaned. It does not drain the canal bottom to prevent growth of vegetation peculiar to wet ground. Between South and Main streets the canal is polluted by ducks; and, still worse, by a drain from the closets of the Montour House, which was laid about 1847, while the canal was in operation. These closets are now flushed into the canal by a

small spring led into the drain and storm-water from the roof. The contents of these privies now lie in the canal prism adjacent to the business part of the village, a disgusting, noisome and fever-breeding mass of filth during warm weather. The village board of health should see that this drain is permanently closed, and said closets put in good sanitary condition at once. There is, beside, one or more privies in dangerous proximity to the canal, and a barn or two overhanging the canal that could be looked after with advantage to public health.

Along Catharine creek and its tributaries in the village it seems as though every householder that could had put his privy over, or dangerously near, the water. This is, in my judgment, a dangerous sanitary experiment, with so little water in the creeks during the summer months. The periodic freshets that drive most of the people in the eastern part of the village into the upper story of their homes and render pedestrianism in the streets without high rubber boots unpleasant are, in reality, blessings in disguise, and form necessary and providential sanitary measures. There are complaints of privy vaults not on the canal, also a slaughter-house in the eastern part of the village, that for some reason have not received the attention they demand.

Amid the surroundings described above it is not surprising that the people here suffer, as a result of their carelessness and want of foresight, from diseases attributed to such conditions.

During the past four months nearly all the children have had *scarlet fever*, although in a mild form.

There have been during the same time about forty cases of *malignant sore throat*.

During the year 1884 there were about twenty cases of *typhoid fever*, about its first appearance in the village.

There are now several cases of *malarial* or *low fever*, as well as cases of *rheumatism*, attended with malarial symptoms.

Of late there have been and are several cases of *consumption* where there was no hereditary tendency, as well as cases of *genuine fever and ague*, both in the valley and surrounding hillsides.

REMEDY PROPOSED.

I would suggest that the village board of health cause a general and thorough inspection of the privies, wells and surroundings of all dwellings and cause the same to be put in good sanitary condition, without delay, and have the same inspected often afterward to see

that they are properly maintained. This will include the removal of all privies now on or near the creeks and canal as previously mentioned. No privy having a vault should be allowed within twenty feet of the water in said creeks or canal.

DRAINAGE OF CANAL.

I would also recommend the drainage and partial filling of the canal prism. The bridges have been removed from Ayres, Main and South streets, and the street crossings filled in. Through the two last-named stone culverts were laid allowing free passage for water. At Ayres street an old State scow was sunk and a lot of stones loosely thrown in the canal bottom, with the intention that the water would percolate through. No culvert was laid. The level of the canal north of this street is practically the same as Seneca lake, three miles north.

PLAN FOR DRAINING CANAL.

I recommend the filling of the hole between Ayres street and Lock 1, material for which can readily be obtained around the lock.

From the north side of Ayres street to the south side of South street, I propose the laying of a twelve-inch vitrified sewer pipe with a grade of one foot in eight hundred; although the grade is rather light, I feel confident it will be ample for the purpose. Water will doubtless be found at the depth the sewer will be laid which will readily find a way into the sewer through the joints, as will the surface water along the canal bottom as far south as South street.

At the south end of said sewer, I propose making a catch basin about six feet by eight feet which can run below the level of the sewer and serve as a settling basin.

There should be no connection made with the sewer for sewage, as there will not be water sufficient to properly carry it off. Not more than one man-hole, if any, will be needed.

The sewer should be laid in a direct line from end to end and be kept as near as possible in the center of the canal prism, avoiding at the same time the scow at Ayres street, and the culverts at Main and South streets. If this is feasible, it would be possible to see through the sewer from end to end. If a bend proves necessary, it should be near the center and a man-hole constructed at the bend for the proper inspection of the sewer.

DRAIN TILE.

From the catch basin south to Lock 2, I propose two lines of six-inch drain-tile laid near together or separated as may seem best when the water is drawn off. It may be necessary to lay a third tile as far south as the crossing by the Pottery. From Lock 2 south, to near the south line of Geo. Everts land, one line of six-inch drain-tile will, I think, suffice.

Just north of the old waste-wier in the canal (see map), I propose a dam to be made of earth to the height of the tow-path. Then any water coming down the canal will run eastward into the creek. In time of high water in the creek it now backs up into the canal. A dam was at one time constructed here by the State, and private parties took it out to let more water down to the village, in the canal.

Above Lock 3, the canal is above the creek and little trouble will be experienced in draining it at any point it may seem necessary into the creek which runs near it for ten miles or more; or the line of drain-tile may be continued at any time if deemed advisable, there being sufficient fall available.

After the sewer and drain-tile are in, it will, in my judgment, be advisable to cover the bottom of the canal prism to a depth of at least six inches, with clean earth and gravel.

For the lower half mile or more, the material for filling will need to be obtained outside canal property. There is an abundance of good material at and above Lock 2, also a bank of gravel available at nominal cost near the west end of South street.

Not knowing if the bottom of the trenches for tile will be firm enough, I have estimated for laying the tile on boards one inch thick and eight inches wide.

AN ESTIMATE OF THE EXPENSE OF THE WORK PROPOSED.

Two thousand four hundred feet 12-inch sewer pipe at fifty cents per foot.....	\$1,200 00
Laying the same at seventy-five cents per foot.....	1,800 00
Seven thousand five hundred feet 6-inch drain-tile at three cents per foot	225 00
Laying the same at three cents per foot.....	225 00
Five thousand feet boards 1-inch x 8-inch at thirteen dollars per thousand.....	65 00
Constructing catch basin.....	50 00
Constructing one man-hole.....	50 00

Constructing dam.....	25 00
Filling lock below lock 1.....	60 00
Ten thousand cubic yards earth for covering prism at twenty-five cents per cubic yard.....	2,500 00
Total.....	<u>\$6,200 00</u>

I have endeavored to ascertain as correctly as possible the amount of released land along the canal within the corporation, and have shown it on the map by a tint. It will be seen that a large part of the canal, where the sanitary conditions are worst, still belongs to the State. No more will be released for the present.

I have suggested a plan for drainage rather than filling, believing it preferable even if gradually entirely filled, as well as much cheaper than filling all at once.

There can be no doubt but that the canal at present is a fruitful source of disease and malaria, notwithstanding the extremely careless condition of the rest of the village, and it is my judgment that the State should contribute largely in carrying out any plan for its drainage or filling. In equity the holder of releases should be willing to abide by them and pay their portion of the expense, especially as to the filling in after the sewer and tile are laid. The greater portion really needing drainage is still unreleased and at the upper end, while to drain this the most feasible outlet is through the lower portion. Taking this view, it would be only just that the State should bear, in part, at least, the expense of the sewer, besides its assessment *pro rata*, owing to the unreleased land.

Respectfully submitted,


O. S. WILSON,

Civil Engineer.

MAP
OF THE
VILLAGE OF HAVANA.

Jan. 1885

Scale—1 Inch—400 Feet.

NOTE.—Released lands shown thus 



REPORT ON THE POLICY OF THE STATE RESPECTING DRAINAGE OF LARGE SWAMPS.

To the State Board of Health :

A series of laws respecting the drainage of lands for sanitary purposes have from time to time been enacted in this State. The last act, which stands as the Drainage Law of the State, was passed May 12, 1869. Many drainage works have been attempted, and some have been executed under the provisions of this law.

The general outlines of the act require the appointment of a commission by the court. The commissioners are to decide upon the necessity for the drainage work, and also upon the plan for its accomplishment. The funds are to be raised by the commissioners, assessing the cost of the work upon the parties benefited.

Attempts to apply this law to drainage works on a large scale have been partial or complete failures. The reasons are many. Prominent among them is the fact that all the parties interested in the drainage of a large swamp tract can never be brought to agree either upon the necessity for the work, or the best means for its execution ; while some who are interested desire the work, a large minority generally resist to the utmost the execution of the drainage project. This minority has so much power to obstruct the action of the commissioners, and to delay or prevent the collection of assessments on their property, that no commissioners are willing to become personally responsible, as they must, for the large sums needed to execute extensive drainage projects. The collections cannot be made until the work is done ; and the uncertainty of collecting assessments makes it impossible for commissioners to borrow or

obtain the money to carry out the work, except by becoming themselves personally liable.

In addition to this, the drainage plans obtained by commissioners are usually made by local surveyors or engineers, who have had little or no experience in large drainage works, and whose knowledge and skill are therefore necessarily inadequate for difficult hydraulic undertakings.

The experience, therefore, of the State under the present drainage law shows it to be ineffective for extensive undertakings for three reasons: First, the impossibility of securing co-operation among a large number of people interested in an extensive work; second, the failure on the part of the commissioners to obtain proper engineering advice; and third, the difficulty in collecting assessments.

In many parts of the State, there are great swamp tracts now waste and worthless as regards agricultural purposes, and baneful in their effects upon the health of all exposed to their miasmatic influence. These swamp tracts include hundreds of thousands of acres, much of which might by proper drainage be converted into the most fertile and productive territory of the commonwealth. In the neighborhood of Horseheads, in Chemung county, I saw this summer lands which a few years ago were waste swamps, and which now, by drainage, have become worth from three to four hundred dollars an acre, owing to the valuable crops of celery and onions which they produce. The drainage of these lands was made possible by an outfall built by the State, originally for the Chemung canal; but now drained of its waters, it acts as a necessary outfall channel for the drainage of the surrounding lands.

Had it not been for the existence of this outfall channel, furnished by the State, these lands must have remained saturated swamps, valueless for agriculture and harmful to health.

As soon as the waters of the canal were drawn off, and the abandoned prism became useful as a drainage channel, the owners of the adjacent swamps availed themselves of the opportunity, and by the expenditure of large sums thoroughly reclaimed their lands.

The history of these lands in the neighborhood of Horseheads would, I believe, be repeated in every part of the State where swamp tracts exist, and where their reclamation is not possible to private effort on account of the absence of those great outfall channels into which all private drains must eventually discharge.

The investigations of this Board and of the State Survey into the Oak Orchard swamp show that the building or improving of a gen-

eral outfall channel in that locality, would enable the owners of twenty-five thousand acres of swamp lands to drain and reclaim them with a certain increase in their value of not less than two and a half millions of dollars, while the construction of the outfall channel could probably be done at a cost of one hundred and twenty-five thousand dollars. The general outfall channel here spoken of would pass through two counties and a number of towns, being some seventeen miles in length. To execute such a work by the co-operation of widely scattered owners of different minds and small means has proved simply impossible. The policy of leaving the reclamation of the great swamps of the State to private efforts has been tried for a number of years, and has proved a complete failure. It will doubtless continue to be so, owing to the utter impossibility of securing unity of feeling and purpose among the many owners interested in such lands.

Moreover, in many cases the payment of even the small assessment per acre, which would be necessary for constructing the larger outfall channel for the drainage of a great swamp, would be an impossibility for many of the owners, owing to the present valuelessness of the land. It is this fact which has led to the adoption in England of the policy of the government aiding the locality to execute large drainage works both with plans and with means, and requiring repayment on the part of the locality.

This repayment is made slowly, so that the poorer owners on whom the assessments fall may have time to reclaim the lands and make these payments out of the large financial profits which are sure to follow thorough drainage. Malarial diseases have been almost driven out of England by the drainage works of the past hundred years.

I am satisfied that local and private effort has been and will continue to be utterly unable to cope with the financial and engineering problems involved in the drainage of the larger swamps of this State, and that their reclamation can only be accomplished as in England by the interposition of the State authority.

It is impossible to say how many thousands of people are being damaged in health, how many lives are each year destroyed, or how many hundreds of thousands of dollars are annually lost to the State from the existence of these great malarial wastes, which might be turned into most fruitful acres, and be deprived of all power to breed disease.

A policy might, I believe, be adopted, which would add at least two hundred and fifty thousand acres of most productive land to the taxable property of the State, the value of which when reclaimed and cultivated would be increased over the present value not less than a hundred dollars an acre, or an aggregate of twenty-five million dollars; and this twenty-five million dollars worth of real property could probably be secured by an expenditure on the part of the State of New York insignificant compared with the return. The comptroller is now constantly loaning the funds of the State. These investments bring no return except the principal and the low rate of interest obtainable. If loaned to localities for the reclamation of extensive tracts, the State would receive in return not only principal and interest of the loan, but an enormous benefit from the increase in the amount of taxable real property. The loans would be as safe as those made at present, and be productive of incalculable good to the people. The pecuniary result does not, however, fall within the province of the State Board of Health to consider; but the magnitude of the effect on the lives and health of great bodies of citizens makes the subject one of most serious import to this board.

Vast numbers of people in many parts of the State are found suffering from the influence of saturated soils, the drainage of which is practically impossible if the enterprise is left to local efforts. Not only is there sickness, suffering and death, but the depressing miasmatic influences of these swamps are felt in a decrease of working power among thousands who do not appear to be actually ill. The effective working force of man may by malarial influence doubtless be reduced to one-half of what it would be in healthful districts.

If the present policy is persisted in of leaving to local effort the impossible undertaking of draining the great swamp tracts of the State, nothing will be done. Disease and its attendant poverty will stalk about these dreary marshes and the millions of dollars which might be annually earned from rich harvests, were the lands reclaimed, will be lost to the wealth of the State. I therefore advise the State Board of Health to recommend to the Legislature the passage of an act to promote the drainage of the great swamps of the State. I would briefly suggest the following points for this act:

First. On complaint of interested citizens, or of a board of health having jurisdiction in a locality, the healthfulness of which is claimed to be affected by the whole or part of a swamp, or of satu-

rated lands exceeding in extent one thousand acres, the State Board of Health, or a standing committee thereof, shall investigate the sanitary condition of the region adjacent to the swamp or wet lands, giving after due notice at least one public hearing at some convenient point in the neighborhood ; and if satisfied that the drainage of the tract complained of is necessary for the public health, they shall so declare.

Second. When the State Board of Health shall declare the drainage of any tract of not less than 1,000 acres, necessary for the public health, the judges of the Supreme Court, or a majority thereof, of the judicial district in which the tract is wholly or the larger part situated, shall on application of the State Board of Health, appoint three commissioners to execute the work of making the general outfall channels which are necessary to enable the proprietors of the lands to drain and reclaim them, providing that the cost of the work shall not exceed twenty-five per cent of the value of the lands benefited after the execution of this work.

Third. The plan for these drainage works should be approved by the State Board of Health, and its execution should be under their supervision.

Fourth. The Comptroller of the State should be authorized to loan to the locality the sum necessary for the execution of the work for a term of fifteen years at two or three per cent interest, the amount loaned to the community to be expended by the commissioners appointed by the court, but under the approval of the State Board of Health.

Fifth. The commissioners should assess upon the property benefited the sums necessary to provide for the repayment of the principal ; but the interest on the loan should be paid by the towns in which the lands benefited are situated, and the towns should be made responsible for the collection and repayment of the principal of the loan. In considering the distribution of the benefits of these works, all matters should be taken into consideration which enhance the value of the property drained or of adjacent property.

Briefly and somewhat crudely are thus sketched the principles to be embodied in an act which I believe would be successful in bringing about a great sanitary reform in the State and in adding not less than twenty-five millions of dollars to the taxable property. The principles are not new but have been successfully tried in other countries, and there seems to be no reason to think that they are less applicable to the conditions in this State.

The burden which would be imposed on the State Board of Health is a very serious one; but since the work is purely for a sanitary purpose there seems to be no other department which can properly assume it. The lives and health of thousands of our citizens are so involved in this matter of extensive drainage that the State Board has undoubtedly a duty concerning it.

It is now more than a year since the consideration of this matter was referred to me by the Board and a report requested. It is with great reluctance that I have come to the conclusions stated above. The intervention of the State should not be invoked except in the presence of a great public need that cannot be met by local effort. That this great public need exists is evident to all of you who are familiar with the swamp tracts of the State; that their drainage will save the lives of hundreds and increase the health and prosperity of thousands of our citizens you are also aware; that the main drainage channels which are necessary to enable proprietors in the great swamps to drain their lands cannot be built by private effort or local effort, or by co-operation among the communities interested, is a conclusion to which I have been reluctantly forced by a careful consideration of the failure of most of the attempts which have been made in this direction. Involving as it does a recommendation of a policy new to the State, I submit this report to the consideration of the Board with more than usual hesitancy.

Very respectfully,

JAMES T. GARDINER,

Chairman of Committee on Drainage, Sewerage and Topography.

At the quarterly meeting of the State Board of Health on the 11th inst., the above report was ordered printed and the following action was taken:

Resolved, That recognizing the failure of the present law of the State to provide effective means for the drainage of the larger swamp tracts of the State, and recognizing the necessity of further legislation providing other means than those wielded by the localities alone, the Board approves of the policy of the State lending its engineering and financial aid to localities in the execution of such works when necessary for the public health, substantially as set forth in the report of the chairman of the committee on drainage, sewerage and topography.

Resolved, That the report be referred to a special committee appointed by the president to prepare an act embodying the principles set forth therein.

ALFRED L. CARROLL, M. D.,

Secretary.

[Sen. Doc. No. 47.]

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REPORT ON THE SEWERAGE OF SARATOGA SPRINGS, NEW YORK.

To the State Board of Health :

On the twenty-first of August a communication was received from the board of sewer commissioners of the village of Saratoga Springs inclosing a resolution of that body requesting the State Board of Health to visit Saratoga during August, when the sewage of the village was at its maximum in volume and offensiveness, for the purpose of examining into the methods now in use for collecting and disposing of the drainage and waste products of the village, and to make such recommendations in the premises as in its judgment are demanded.

This communication was, in the course of business, referred to the committee on drainage, sewerage and topography.

On looking into this matter I find that the question of the disposal of the sewage of the village has been agitated for a number of years, and that for the last three or four years a local board has been in existence for the express purpose of considering this question and advising an improvement on the present method of disposal. Some experiments have already been undertaken. The report of the sewer commissioners of Saratoga on the subject of this sewage disposal was forwarded to the State Board of Health.

One of the commissioners of the board, who acts as secretary, Col. George T. Balch, is an engineer educated at West Point, and the suggestions made in the report of the sewer commissioners show unusually careful consideration of the subject. In view of the peculiar features of the case, I considered it best to make at once a personal inspection of the grounds, and report to this meeting the results of my observations, in order that the subject might receive the consideration of the whole Board. The general public are so largely interested in the sanitary arrangements of Saratoga, that any

conclusions or recommendations will perhaps be more effective if they emanate from the Board rather than from the standing committee. I, therefore, report to the Board the result of my inspection.

REPORT.

I reached Saratoga on the night of the second, and met the board of sewer commissioners on the morning of the third of September. In company with one of the village engineers, Mr. Mott, I proceeded to examine the line of the main sewer of the village and the brook which runs nearly parallel with it. This main sewer of the village is a three-foot circular sewer from Congress spring to its mouth at White Sulphur springs. Above Congress spring the section of the sewer is twice changed; but the greater part of it is an egg-shaped brick sewer of proper fall and good construction. Above Congress spring the sewer follows approximately the bed of a branch of Village brook. The brook is taken into the sewer and the natural brook bed filled up. A number of springs lying along the course of the brook and to the westward of Broadway have also been taken into the sewer. From Congress spring northward the sewer is approximately parallel with the course of the brook, and the brook bed is walled up and covered with flat stones to a point a little north of Lake avenue. From here the brook runs on to the north-eastward in an open channel. Lateral sewers of vitrified pipe are laid in a number of the streets, both to the east and to the west of the main sewer, but it was impossible for me to judge what proportion of the village was properly sewered, as there was no map of the sewerage system of the village as a whole.

The sewerage system is the combined system, storm water and sewage being both admitted into the sewers. So far as I can judge the main sewer of the village is properly built, has a good fall, and is answering the purpose expected. The examinations of the local sewer board seem to show that all the sewage of the village is delivered at the mouth of the sewer in less than an hour from the time of its entering the main sewer. This sewer does not always follow the line of streets, but in places passes under blocks of buildings. Some complaint was made of bad smells in one of these blocks, the one where the household art rooms are on the west side of Broadway, opposite the park. I found, however, that the yards back of this building occupied a low depression, which was formerly springy; that there were several very offensive privies situated here, and that

large quantities of foul laundry water were being thrown out upon the ground. Some men were engaged in digging a cellar, and I saw, from their excavation, that water was running in eight inches below the surface of the ground. No attempt has been made to drain this spot into the sewer, which is unusually accessible.

The spot spoken of is undoubtedly filthy and unwholesome because no attempt is made to keep it clean and dry. There can be no fault charged against the sewer. But here as elsewhere I found an absence of cleanliness which can only be prevented by a better sanitary administration in the village.

The health officer or some other paid official should inspect the premises of the village and secure cleanliness by a rigid enforcement of the proper village ordinances. This want of proper inspection and care in the sanitary administration of the village is very marked along the course of the Village brook from Congress spring northward. Privies, water-closets, stables and foul-water drains are draining into the brook bed instead of into the sewer. The water-closet in the yard of the Reed and Spencer club-house and neighboring privies, together with drains from Isabel's stable carrying all kinds of waste, enter the brook near Congress street, and from there northward I found drains entering at a number of places. All the drainage of foul water into this brook bed should be stopped and the drains should be completed to connect with the sewer.

North of Lake avenue where the brook bed is open the same thing is occurring; house drainage in large quantities is passing into the open brook channel. The result is a large accumulation of filth along the banks of the stream, which, without question, endangers the public health.

An attempt had been recently made to clean the open part of the brook channel. This cleaning consisted of cutting out the weeds and throwing them and some of the filth from the brook bed on to the banks along the stream, where the compost lay putrefying in the sun at the time of my visit.

As regards the condition of the village itself, therefore, the points which seem most pressing are the drainage of wet and filthy spots and the protection of the Village brook from filth. These can only be secured by making it a duty of some competent officer to care for and constantly inspect the village and compel negligent people to keep their premises clean, and also to see that the bed of the brook is not fouled by house drainage. This brook channel should be kept open for the flow of spring water and storm water. Most of

the prominent springs of Saratoga lie along the course of this stream from Congress spring down to White Sulphur, and every effort should be made to keep the channel of the brook unpolluted.

As regards the admission of spring water and storm water to the sewers, the board of sewer commissioners of Saratoga are desirous of cutting down the storm water and spring water flowing through the sewers to the smallest possible amount consistent with the proper cleansing of the sewer in order that the amount of sewage to be disposed of at the mouth of the main sewer may be greatly lessened. With this view I am fully in accord. Every effort should be made to reduce the volume of water flowing through the sewers by excluding such part of the spring and storm water as is not necessary to maintain the proper degree of cleanliness. That the flow should be materially lessened will appear from the facts developed in the examination during the afternoon of the 3d inst., when, with Col. Geo. T. Balch, secretary of the board of sewer commissioners, I visited the water-works, the out-fall of the sewer, the brook into which the sewer empties and the lake at its mouth. This examination covered also the Village brook which flows nearly parallel to the sewer through its whole length. Such a large amount of spring water enters the Village brook that, although the brook is quite impure at Lake avenue, its volume is so largely increased that the brook becomes so pure in a comparatively short distance that there is no appearance of filthy deposits along its banks until the sewer mouth is reached.

The water supply of Saratoga is derived from Loughberry lake whose outlet enters Village brook about half way between the Empire spring and the White Sulphur spring. Here the pumping-works are situated, which maintain a high pressure in the supply pipes of the village. An accurate account is kept at the office of the gallons pumped for the village supply, from which it appears that the amount pumped during August has averaged about 2,860,000 gallons *per diem*, and that for July the average was about 2,500,000 gallons in twenty-four hours. The other months of spring and autumn are less, the amount pumped into the village being at the rate of 1,500,000 gallons *per diem*. During January the amount pumped increases to 2,500,000 gallons, showing that the water consumed is about the same as in July, although the sewer commissioners estimate that the population of the village during the season * fluctuated from 12,000 to 25,000, while during the remainder of the year

* From June 1 to September 30.

it averages about 10,000. If these estimates of population are correct they represent a summer daily use of water amounting to one hundred gallons per head, and during January a consumption of 250 gallons *per capita*. Such a winter use of water can only be accounted for on the supposition of enormous waste from yard hydrants and fixtures left running to prevent their freezing in the severe climate of Saratoga. In many poor neighborhoods water is not taken into the house, but yard hydrants only are used, and these are doubtless allowed to run freely at night in cold weather to prevent freezing. This very unusual consumption of water of course increases the quantity of sewage to an abnormal extent *per capita*. In summer a large amount of water is doubtless used on gardens and in watering streets, the dryness of the soil rendering frequent irrigation necessary, but in winter the greater part of the water pumped into the village must find its way into the sewers. The maximum amount of sewage which will be delivered at the mouth of the present out-fall in winter can never be less than the volume of water received from the water-works into the sewers.

Since the water system of Saratoga is much more broadly extended than the sewer system it is probable, that even in winter all of the water used from the village water-works does not return to the sewers. Of course it is impossible to tell exactly what this loss amounts to. It seems hardly probable that the winter loss should be over 500,000 gallons a day, so that 2,000,000 gallons of water are probably received into the Saratoga sewers during January, out of 2,500,000 gallons which are pumped by the water-works.

If the water received into the sewers could be limited to this amount, 2,000,000 gallons per day, it would be sufficient for carrying the sewage matter, even of the summer population; but it would give an average of nearly a hundred gallons per day of sewage *per capita*. This amount itself is nearly three times the usual average.

In August, when 2,800,000 gallons *per diem* are pumped, it is possible that under the peculiar circumstances existing in the village, 1,000,000 gallons a day, being thrown upon the ground, are evaporated and do not reach the sewers; in which case the summer flow of water in the Saratoga sewers from water received from the water-works is 1,800,000 gallons a day. If the summer population is 20,000, this would be a flow of sewage proper of ninety gallons

per head *per diem*, without the admission of either storm water or spring water to the sewers. A flow of 2,000,000 gallons per day is certainly sufficient to keep clean the main sewer with occasional flushing.

The spring water now admitted to the main sewer, is in my judgment, unnecessary for the purpose of cleanliness. As regards the exclusion of storm water from the laterals, should the flow from any of them be too small, the difficulty might be remedied by using automatic flushing tanks, since the lateral pipes are most of them from eight to twelve inches in diameter.

It is probable that flushing could be managed either by automatic flushing tanks, or by other means, which from a sanitary point of view would amply compensate for the flushing effects at present received from the storm water. The sewer commissioners of Saratoga requested advice upon this point as they are anxious to reduce the volume of sewage as much as possible in order to decrease the expense of the new out-fall sewer, and render more successful any process of purification which may be undertaken. The sewer commissioners have undertaken the careful gauging of the flow of sewage at the out-fall of the sewer near White Sulphur springs. The observations should be continued. The results of this gauging will enable any engineer charged with the work to form a reliable opinion as to the amount of sewage which would be received and have to be cared for at any new out-fall which is prepared. At present the sewage of the village empties into the Village brook just below White Sulphur springs. I found the sewer delivering about 3,100,000 gallons *per diem* while the village brook had a flow of only about 2,500,000 gallons of water. The sewer is circular, having a fall of about three inches to the hundred feet. From the point where the sewer enters it the Village brook runs about three miles down to Lonely lake a pond about half a mile long, which has an outlet into Kayaderoseras creek and thence into Saratoga lake.

The course of the brook is quite tortuous during the last mile before reaching Lonely lake, being through a swamp. The fall from the mouth of the sewer to Lonely lake is twenty-four feet.

The brook crosses five prominent roads, the Williams road, the Schuylerville road, Lake, Union, and Nelson avenues. Union avenue crosses the brook some half a mile above its entrance into Lonely lake where the land is low and swampy. I followed the brook from the outlet of the sewer for some distance down its

course, on foot, and then examined it above and below each road crossing. The whole stream was filled with a mass of sewage, which was lodging against every twig, or tuft of grass, or other obstacle to the flow of the stream. In every eddy the sewage was depositing putrefying masses. A recent freshet had raised the brook so that the sewage was found deposited over all banks of the stream and back as far as the flood water had extended.

In the swamps near Union avenue, the back water from the stream had evidently extended some distance, and the sewage was deposited over the top of the muck and on the tufts of grass there to putrefy in the sun. The odor from this brook was apparent everywhere along its course. At its crossing with Union avenue, the smell was so strong at seven o'clock in the evening as to be perceptible some distance from the brook. The land is here so low that at sunset, or in the early evening when the first chill comes, a moist stratum lies heavily over the swampy tract where the brook crosses. The smell of decomposing sewage is, therefore, particularly noticeable at this point.

Union avenue is the main drive from Saratoga to the lake, and is most frequented late in the afternoon and early evening, so that great numbers of visitors to Saratoga are exposed to the conditions above described. Several gentlemen, returning from the lake on the evening of September 3d, noticed the odor and spoke to me about it. Among them was Judge Maynard, Deputy Attorney-General. In fact, the odor was so pronounced that there could be no question about its existence.

I have carefully examined the Bog Meadow brook, a stream a little larger than Village brook, which runs parallel with Village brook, and crosses Union avenue in the same low lands. The deposits along this brook are entirely uncontaminated, and there is no odor perceptible where the road crosses the pure stream. The natural conditions are alike in these brooks, and were the odors simply due to the swampy character of the ground, they would be as evident at Bog Meadow brook crossing as at the crossing of Village brook. At the mouth of Village brook in Lonely lake, the sewage is depositing both in the bottom of the pond and along the shores of the lake where putrefaction is constantly going on, from which most offensive vapors rise. The people who live along the outlet of Lonely lake testify that in the early morning or in the evening when the air is moist and when the wind is from that direction these odors are distinctly perceptible. This deposit at the north end of Lonely lake is taking place within a comparatively short

distance of the popular resorts which lie near the outlet of Saratoga lake. If the county map is to be relied upon, the distance from these deposits to Truax's restaurant, which is the nearest of these resorts, cannot be a quarter of a mile. I see no reason why the emanations from these sewage deposits should not, with the proper condition of the atmosphere, go as far as Moon's restaurant, where hundreds of visitors are entertained every afternoon and evening. A number of farm-houses are situated along the course of the brook. Some of them within a few hundred feet of its banks. One of these, called the Halfway House, stands on a bluff, around which the brook runs in a half circle. Its position is such that it is very much exposed to any emanations from the sewage in the brook. The deposits of sewage along the banks of the stream, and on the bushes and twigs which overhang it, begin just below the mouth of the sewer within a few hundred feet of White Sulphur spring where an average of one hundred and forty people bathe daily. When the wind blows up the valley along the course of the brook toward Sulphur spring the inhabitants of the house say the smell is very strong and it certainly appears as if it must be. The filthy deposits extending along the whole course of Village brook from the sewer mouth to Lonely lake; the deposits of filth in Lonely lake and along its northern shores, and the filth deposits in the swamps near the crossing of Union avenue, were sufficient evidence to show that a dangerous nuisance was caused by the pouring of sewage into Village brook. I visited the outlet of Lonely lake to see how far the effects of this sewage could be traced. I found a stream at the outlet of Lonely lake discharging perhaps ten or twelve million gallons *per diem*, turbid with a growth of green slimy vegetation. Several people living along the banks of this outlet testify that this peculiar vegetable growth had never occurred until the sewage was poured into the lake. However that may be, the water is at present in such a condition that at every rise and fall of the stream organic deposits are left along the shores of Lonely lake outlet which cannot but be injurious to public health. The Village brook is so polluted that no cattle should be allowed to drink of its waters. The above facts are I think sufficient to convince any one that the effect of pouring the sewage of Saratoga into Village brook has been to convert the whole flow of the stream into sewage and to make of it an open sewer from White Sulphur springs to Lonely lake; that not only is the water throughout the whole course a turbid flow of sewage, but with the fluctuations of the stream this sewage is deposited on the

banks of the brook and is at all times clinging to the twigs and vegetation which hang in the current of the stream, and is deposited in all the eddies and shoals along the channel. Furthermore an inspection of the brook at dusk, when the air is still on a warm evening, will convince anybody that offensive putrefaction is going on.

How great is the number of people exposed to these injurious conditions may be inferred from the following facts: A prominent bathing resort, White Sulphur springs, is situated near the out-fall of the sewer; there are a number of dwellings located so near the brook and its adjacent swamps as to be liable to be affected by any miasms rising from sewage decomposition; there are several popular restaurants and resorts within a comparatively short distance of the filthy deposits at the north end of Lonely lake, and the swampy places through which the brook runs are necessarily crossed by the favorite drives for visitors at Saratoga Springs, who are, therefore, exposed at the most dangerous hour of the day to the exhalations from the filthy deposits along Village brook.

It is the knowledge of these facts which has impelled the sewer commissioners of Saratoga to seek for another method of disposing of the village sewage. They have caused surveys to be made for the extension of the present sewer eastward to Fish creek, a large stream which is the outlet of Saratoga lake, having a flow of from seventy to one hundred million gallons per diem.

That something must be done and that soon to stop the pollution of Village brook is obvious. It remained, therefore, only for me to examine the various plans which had been proposed for the disposal of the sewage in a proper manner.

REMEDIES TO PREVENT THE POLLUTION OF VILLAGE BROOK.

There are several available methods of disposing of the sewage of Saratoga, which would be improvements on the present state of things. The first is to purify in some way the sewage at the outlet of the present sewer and so turn the water into the Village brook to a certain extent clarified. Partial clarification of sewage may be accomplished by settlement in tanks, by settlement and chemical precipitation in tanks, by filtration through artificial filters and by filtration through soil either by a broad or limited irrigation and thorough underdrainage. A simple settlement in tanks without chemical precipitation frees the sewage of but a small portion of its

nitrogenous matter, so that the effluent water from the tanks, if this method were tried, would be turned into Village brook in a very impure condition. The precipitation of the organic matter of sewage by chemical treatment has been experimented upon for many years in England, and a number of processes are in more or less successful operation at different places. The process which depends upon the use of lime is on the whole not as effectual as that which depends upon the addition of the sulphate of alumina and some salts of iron. The most successful of these chemical processes precipitate not only the suspended organic matter in the sewage but also an important percentage of that in solution, so that the effluent water is quite pure as compared with the sewage. The difficulty, however, with the most effective of these processes is their expense.

A process of partial purification is now practiced at Coney Island, which is claimed to be accomplished at a small cost. I have, however, no means of knowing what proportion of the putrescible matter is removed by this process. Some of the solid particles, especially the larger, are removed, but it is certain that the effluent water from the tanks, used in Coney Island, is not in such condition that it could be safely poured into so small a brook as Village brook at Saratoga.

As respects the artificial filtration of sewage, none of the processes that I know of have succeeded for any length of time at a small cost, in so purifying the sewage as to render it safe for the effluent water to pass into so small a brook as the Village brook. As regards the methods of irrigation, they do not seem to me feasible in Saratoga, because of the topography of the region, and also on account of the large cost which is involved in preparation of the ground and management of the work. There is no doubt that sewage can be practically clarified by passing it through thoroughly underdrained land, when a sufficient tract can be secured. Sandy or gravelly soil lying properly for irrigation should be selected. The amount of land which would be required for Saratoga is so large and its preparation would be so costly, that even were it easy to find the proper spot, the adoption of the system would be very doubtful policy.

In general it is found in England, that to secure the proper purification of the sewage by broad irrigation requires an irrigating tract of about one acre for the sewage of every hundred people; but since in England the number of gallons per hundred people is so much less than it is here, it is very doubtful whether in Saratoga an

area of even two hundred acres would be sufficient to provide for the purification of the sewage. The expense contingent upon the use of this method in the winter is also large, although it can be successfully treated, as is shown in Berlin, Germany. Considering their cost I cannot say that any of the methods are practicable which would so purify the sewage of Saratoga as to safely allow the effluent water to pass into Village brook, or into Bog Meadow brook, where the volume of water is so small, the land along its banks so low, and the vicinity necessarily very much frequented by hundreds of visitors.

It seems to me that the plan of the sewer commissioners for carrying the village sewage to Fish creek is on the whole the most practicable and economical. If objection should be made to the admission of the sewage into Fish creek, in its natural condition, one of the cheaper systems of partial purification by subsidence in tanks can easily be resorted to at some point on the line of the sewer. Of course these processes of subsidence are more successful the nearer the tanks are to the village from which the sewage comes. The solid particles are larger and more easily settled before they have flowed a long distance. If the sewer commissioners can succeed in reducing the flow of the sewage to 2,500,000 gallons a day, the present sewer could probably be extended to Fish creek by using a twenty-inch vitrified pipe. In the absence of the necessary profiles I am not able to state exactly the amount that would be delivered, but if the fall is as it is reported to be, such that it will at no point have a grade of less than two inches to the hundred feet, a twenty-inch vitrified pipe would be capable of delivering at Fish creek about 2,500,000 gallons *per diem*. The distance from the mouth of the present sewer to Fish creek is in the neighborhood of three miles. A twenty-inch vitrified pipe has been laid in Albany by contract for \$1.77 per running foot, laid in a trench twelve feet deep.

In view of these figures it seems probable that the cost of laying three miles of twenty-inch vitrified pipe at Saratoga might not exceed \$30,000. It is not necessary that the extension of the main sewer should be made larger, for even if some storm water reaches the sewers in times of unusual flow and the amount delivered at the White Sulphur springs should be greater than the carrying capacity of the pipes, an overflow can be allowed into the Village brook without probable harm.

Of course the sewage can safely be delivered into a stream like Fish creek flowing at the rate of from seventy to a hundred million

gallons per day with much less purification than would be necessary if delivered into the Village brook. It would probably be safe to deliver the sewage into Fish creek after the subsidence and removal of the solid portion of the sewage that might lodge or deposit on the shores or shallows of Fish creek.

Should it ever become necessary to produce greater purity than this it can readily be accomplished by more extensive chemical treatment, such as is used in a number of places in England.

RECOMMENDATION.

In view of these facts I recommend that the Board advise the village of Saratoga that the present use of Village brook as a receptacle for the sewage of Saratoga is so polluting the stream and its banks as to create a nuisance which is dangerous to the life and detrimental to the health of the people in the neighborhood of the stream, and to visitors who frequent the vicinity between White Sulphur springs and Saratoga lake; that by this pollution of the stream the owners of land between White Sulphur springs and Lonely lake are deprived of the use of the brook for watering cattle or other purposes; that in view of these facts steps should be at once taken to provide for the disposal of the sewage in some other way, and that, so far as the facts of the case can be learned by the Board, the most practicable method will be the partial purification of the sewage and the conducting of the effluent water to Fish creek by a twenty-inch vitrified pipe.

JAMES T. GARDINER,

Chairman of Committee on Drainage, Sewerage and Topography.

REPORT ON THE MARTINVILLE SEWER.

The following report was presented to the State Board of Health at a special meeting held in Albany, September 8, 1884, by Director James T. Gardiner, chairman of the committee on drainage, sewerage and topography :

GENTLEMEN—The Governor, on the 14th of July last, referred to the State Board of Health for examination and report a petition from citizens of Albany calling attention to a serious nuisance which for many years has existed in the city of Albany on Beaver creek, more especially in the region known as Martinville, and for relief from which they have vainly applied to the city board of health and the common council.

Following this reference from the Governor came a petition signed by nearly two hundred citizens :

“ To the State Board of Health :

“ The Governor having already referred to your honorable body for investigation the complaint regarding the nuisance at Martinville, along the Beaver creek, we, the undersigned residents living in the locality affected, do most earnestly petition your honorable body to make your examination most thorough, and in view of the threatened invasion of the cholera from Europe, to present us with a plan by which the evil may be remedied.”

The matter being referred to me I proceeded as soon as possible to examine the ground and to confer with the health officer of the city and some members of the city board of health, also with the city engineer and several prominent citizens. It seemed to be the

desire of the local health authorities as well as of the large body of citizens who signed the petition, that in view of the many efforts which had been made and which had failed of results in abating this nuisance, the State Board of Health should do more than make a general examination and general recommendation upon the premises, such as had been made over and over again by the city board of health. The unanimous wish seemed to be that the State Board should undertake a detailed examination of all engineering and sanitary points involved and fully set forth the facts of the case, together with clearly defined plans for remedying the evil whose existence has long been notorious; the hope being that an authoritative exposure of the facts, together with a clearly defined line of action by which relief might be found, would create such public feeling that the needed measures would be at once taken for the relief of the city from a danger threatening a large district.

An inspection of the valley of Beaver creek convinced me of the magnitude of the evil and of the fact that it was not a mere local matter; but that the present condition of Beaver creek threatened the health of a district extending from Clinton avenue on the north to the Penitentiary on the south, including the park, in addition to the region bounded by Madison avenue on the north, by Delaware avenue on the west, by Grand street on the east, and extending southward to the hills beyond Martinville.

To properly understand the facts and to determine with certainty the remedy for some of the conditions observed required far more accurate maps of certain parts of this territory than were in existence. The services of Mr. Horace Andrews, a civil engineer of experience, were therefore secured to make the necessary surveys and maps and to ascertain such facts as were related to the questions involved.

The maps and Mr. Andrews' report of the facts ascertained by him are appended to his report, which contains also his views as to methods of relief. After the maps were complete and the preliminary facts ascertained, I gave a number of days of study to the ground and the questions involved. With these preliminary remarks I beg to submit for your approval the following

REPORT.

The stream called Beaver creek is a natural drainage channel, whose branches drain all that part of the city bounded on the north

by Clinton avenue, on the south by a line parallel with and near the New Scotland road as far out as the trotting park. The most western extremity of this area being three-quarters of a mile west of the toll-gate on Western avenue.

This drainage area includes Washington park, Western avenue, Madison avenue, the Boulevard, three-quarters of a mile of Clinton avenue, the grounds of the county house hospital, the alms-house, and the penitentiary. East of Lark street the area draining into Beaver creek extends almost to Madison avenue on the north, and includes part of the grounds of the executive mansion near the corner of Elm and Eagle streets. The whole drainage area covers some fourteen hundred acres, the greater part of which lies west of the penitentiary grounds. Over five thousand drain into Beaver creek above Delaware avenue. A detailed description of the stream and its branches will be found in Mr. Andrews' report.

The facts show clearly that this stream is one of the great natural water channels of the city of Albany, the preservation of which is necessary for the drainage of the whole western part of the city including Washington park. As respects the city of Albany the stream is in no sense a local one, but is of general value for the drainage of a great part of the city.

Below Lexington avenue on the New Scotland road whence the main channel of the stream runs down to the river, the area draining into it is comparatively small. The necessity for using Beaver creek as one of the great outfall channels provided by nature for draining the city has been apparent from the first. As population has increased along its banks from the Hudson river westward it has been arched over and used as a sewer for the discharge of storm water and sewage. For the protection of such channels it is always necessary that they should be covered in populous regions, otherwise they are soon obstructed, their usefulness impaired and a nuisance created. Beaver creek has for these reasons been made a closed sewer from the river to Swan street; and inclosed for a short distance at Delaware avenue, in an arched sewer eight feet broad and eight feet high. Between Philip street and Swan street the sewer has also these dimensions. The construction and maintenance of this sewer is not merely for the benefit of adjoining property owners, but mainly for the benefit of the great tract of the city which must be relieved of its storm water and sewage through this natural channel.

The part of the city dependent on Beaver creek for drainage is so large and its parks, avenues and boulevards so frequented by citizens, that the whole city may be said to be interested in the protection and maintenance of a proper channel for that stream.

POLLUTED GROUND AT MARTINVILLE.

The conditions existing along this creek are at present creating dangerous nuisances at several points. At Delaware avenue Beaver creek enters a gorge which deepens to a ravine over a hundred feet deep at Hawk street. From Delaware avenue down to Swan street the stream runs rapidly down a rocky gorge, descending about one hundred in the distance of nine hundred feet. From Swan street to Eagle street the bottom of the ravine is comparatively flat, the descent being only about eleven feet in seventeen hundred. Martinville is situated about this flat. The breadth of the flat is about two hundred feet in its broadest part. The slopes of the ravine on either side of the flat valley at Martinville are, in places, nearly as steep as a hill will stand.

East of Eagle street the natural drainage of the flat valley has been cut off by a deep filling of some thirty feet in depth, so that the Martinville flat now forms a long basin or oval bowl, the lowest place in the rim of the basin being thirty feet above its bottom. This filling has been done by the grading of Philip and Eagle streets.

The topography of the locality is clearly shown on the topographical map of the vicinity of Martinville accompanying this report. The bottom of the sewer is approximately upon the bottom of the valley. There is no means of draining the valley except through the sewer.

If openings are made into the side of the sewer to admit the drainage of the valley the sewage must overflow into the valley, when water rises in the sewer to a height above the surrounding flats. This actually occurs, and in addition to this outflow of sewage from the main sewer, the Martinville flat is receiving a large amount of sewage from sewers and drains which have simply been built to the brink of the ravine, and then the sewage allowed to flow in streams down the hill-slopes, these lateral streams of sewage soaking not only the slopes above the valley but overflowing the flat bottom land whenever the water in the sewer was too high to receive them. A lake of concentrated sewage over six hundred feet long

by two hundred feet broad lies permanently in the western end of the Martinville valley, while the flats above it are flooded in time of heavy rainfall or in the spring, and are alternately wet with sewage and dried by the sun.

The stench of these putrefying flats is most offensive. I have never seen a viler hole in any city, nor one more calculated to breed disease. The sewage-soaked part of the flat is fifteen hundred feet long, and the saturated slopes of the valley add to the polluted ground exposed to the sun. With every storm the filth from the plateau above is washed down on to these slopes and into the bottom of the valley. The tract of polluted ground is some six hundred feet broad by some sixteen hundred feet long, and its worst parts lie within eight hundred feet of the State's executive mansion, within five hundred feet of Elm street, and within a thousand feet of Madison avenue, while a large number of laboring people are obliged to live immediately upon the borders of the sewage lake.

The physicians who attend the people of this locality unite in their testimony as to the great amount of malarial, typho-malarial and typhoid fevers occurring in the neighborhood. There can be no doubt that all the filth diseases develop on this congenial ground, and it is to be expected that the malarial miasms under the influence of prevailing southerly and south-westerly winds will at times extend over the city, at least as far as Madison avenue. The healthfulness of the executive mansion is seriously imperiled by the existence of these sewage-soaked lands, alternately wet by sewage floods and dried by summer sun. If the cholera should visit Albany during the coming year, there can be little doubt that it would find in and about Martinville the very conditions of moisture and putrefying filth which are known to be most favorable to its development and fatality.

REMEDY FOR NUISANCE.

Two things are absolutely necessary to remedy this saturation of the valley and its slopes with sewage and polluted storm waters.

First. The filling of the valley to a height at the sewer four feet above the sewer bottom. This filling should slope back from the sewer to a height six feet above the sewer bottom at the south side of the valley, so as to give sufficient surface slope to carry the surface waters down to the sewer. Filling the valley to a height of less than four feet from the bottom of the sewer will not be sufficient to prevent its constant overflow. A height of six or eight feet

at the sewer and ten feet at the edges of the valley would be better. A filling of four feet at the sewer is the very least that will answer the purpose of drainage, and it will even then be liable to overflow in times of spring freshets.

Second. All of the sewers and drains which now discharge their contents down the slopes of the Beaver creek valley must be either cut off and permanently closed or else they must be connected with the main sewer. The small private drains which are now polluting these slopes should be stopped and the drainage from these houses collected in regular sewers which should enter the main sewer by closed connections.

At the corner of Swan and Park avenue, just by Hinckel's brewery, two sewers and a large brewery drain pour their polluted water out on to the bank, whence it descends as an open stream into the valley below and winds its way slowly toward an opening in the sewer, being joined in the flat by a stream of sewage from the Dobler brewery. At the time of my first inspection a stream of sewage ran down from near the corner of Hawk and Myrtle avenue, the outlet of the Hawk and Elm street sewers. This has since been diverted into a wooden box drain which now carries it down Hawk street to the main sewer.

A sewer down Warren street also discharges into the open valley and a polluted stream comes down between Martin and Morton streets. The position of these streams of sewage and the sewers with which they connect are shown on the accompanying topographical map of Martinville. The outlet of the Swan and Park avenue sewer may be a little difficult to manage, since it must be carried down a rocky bluff, but there will, I think, be no difficulty in conducting it down this bluff in an iron pipe inclosed in a somewhat larger wooden box, the space between being packed with saw-dust to prevent freezing from exposure to the air in winter.

But by whatever method the drains or sewers are brought down to the main Beaver creek sewer it should be done in closed tubes or boxes. Owing to the fact that these slopes are in places sliding and any structures placed upon them at present can be but temporary, wooden box drains may in such places be allowable.

Without the filling of the Martinville flat as before described, and without the stopping of the flow of sewage down the slopes of the valley, there can be no abatement of the nuisance at present existing at Martinville. The connecting of the lateral sewers and drains with the main sewer should be proceeded with at once on ac-

count of the comparatively small outlay required, without waiting for the filling of the valley, which will take some time even if it be begun now. In order to stop the private drains public drains will have to be made to accommodate the inhabitants.

Quite a large amount of sewage comes from the houses on Myrtle avenue between Swan and Hawk streets, which cannot be permanently provided for until Myrtle avenue is graded between Hawk and Swan, and a permanent sewer put through the avenue. Temporary provisions should, however, be made for collecting the drainage from these and other houses along the brink of the valley, and discharging the sewage by box drains into the main sewer. There is also an undrained hollow into which sewage is discharging and creating a nuisance near the north-east corner of Dove street and Myrtle avenue. It is absolutely essential that the discharge of drains or sewers on to the hill slopes or into hollows should be at once stopped. Where permanent provision is impossible, owing to future filling, temporary sewers should be laid.

NUISANCES ON THE UPPER COURSE OF BEAVER CREEK.

Besides the great nuisances which exist at Martinville, a very serious danger to the public health is found on the stream above Swan street, from the fact that it is an open water-course, greatly polluted by sewage discharge from above. Between Swan street and Delaware avenue the stream is carried in a closed sewer part of the way; but from Delaware avenue to Lexington avenue it flows as an open brook through the Penitentiary grounds and through Myrtle avenue, which is not here open as a street, the distance as the brook runs being nearly half a mile.

This open sewer is within 600 feet of Washington park, where thousands of the citizens of Albany seek recreation and health. It is so situated with reference to the most frequented parts of the park that the southerly winds of summer must carry the effluvia from the stream over the whole of the region. All the dwellings along the central part of Madison avenue are likewise exposed to its harmful influence. The report of Mr. Andrews shows that the sewage of over 4,000 people is being discharged into this brook above Lexington avenue.

The effect of a sewage-polluted stream is to form deposits of filth in all the eddies along its course, and upon grass, bushes, and other slight obstructions that hang in its current. With every rise of the stream the sewage-laden water floods its banks, and as the

water recedes the sewage is deposited, and lies putrefying in the sun until the next flood replenishes the deposit with new matter for decay. As the water decreases in summer the sewage deposits in the shallower parts of the stream are also exposed to the sun, and putrefaction proceeds with great rapidity.

Such polluted channels, are, therefore, most favorable breeding grounds for all the filth diseases.

There can be no question that the condition of Beaver creek between Lexington and Delaware avenues with the brook channel used as an open sewer for the sewage of over four thousand people, is endangering the life and health of not only a great number of residents in the vicinity, but of all the people of Albany who seek health and recreation in Washington park. The same may be said, although perhaps in a lesser degree owing to a smaller amount of pollution, of the southern branch of Beaver creek west of Lexington avenue, which runs nearly parallel with Madison avenue, and distant from it between three and six hundred feet along the side of the park. The whole sewage of the county house hospital, including the excrement of patients with infectious diseases, is brought into this stream not three hundred feet from Madison avenue, near Robin street, thus endangering the health of the residents of that part of Madison avenue, and impairing the healthfulness of the western end of the park. From the corner of Lexington and Myrtle avenues the main branch of Beaver creek runs as a closed sewer through the park as far as the north side of Western avenue. Above this point it is again an open brook, polluted with the drainage of a large district lying between Clinton and Western avenues and extending from Robin street to the western reservoir. The sewage of a large population is poured into the brook north of Western avenue, endangering not only the health of the people of that region but of all who use Western avenue for driving. One of the worst places on the stream is within a thousand feet of the park, and the exhalations from this polluted brook course must be carried over the park whenever the wind is from the north-west.

The park is, therefore, flanked on the south-west, south and the north-west with open channels grossly polluted with decaying sewage. Central avenue, Washington avenue, Western avenue, Madison avenue, and the New Scotland road where they are principally frequented, all lie within the influence of these filthy streams, as do the homes of hundreds of citizens, rich and poor.

No further statement of facts will certainly be needed to show that the course of Beaver creek should be made a closed sewer, and that the whole city is deeply interested in carrying out this work.

CONDITION OF THE PRESENT BEAVER CREEK SEWER.

Objection has been made in continuing the arching of Beaver creek on account of the fact that the sewer at present existing below Swan street is incapable of accommodating the flow of sewage and storm water from above in times of flood. The city engineer is confident that the present sewer is capable of meeting all requirements. To determine this question I ordered a survey of the accessible part of the sewer. The results are shown in a sectional diagram accompanying this report.

The survey shows the elevations taken by Mr. Andrews along the bottom of the sewer at each man-hole. Between Grand street and Philipstreet, it will be observed that the sewer is very much contracted in its height while its breadth is increased two feet. The grade, however, is so much steeper at this point that the sewer is capable of discharging as much water as the larger structure on the flat above, except when the flow is checked by the setting back of the river water in times of high freshets. There is no record of the flow of Beaver creek in times of freshets which enables me to say how much water this stream will deliver above Swan street, in times of freshets. It is possible that such an amount may be thrown into the sewer above Swan street, that the sudden checking of its velocity on the Martinville flat may at times fill the sewer and cause it to overflow.

It has several times burst at this point. The city engineer affirms that these accidents were due to the obstructing of the sewer at one time by a tree swept in from above, and at another time by the centering of arches, which had been left in after some repairs. However this may be, the structure is now weak because the arch is not properly loaded with earth. I observed that it is in one place cracked along the crown of the arch for several hundred feet. It should be repaired and the arch well loaded with earth.

While I cannot approve of putting such an important structure upon a plank foundation without an invert, yet, all things considered, it appears that the present Beaver creek sewer will answer present purposes, except, possibly, in times of highest freshets. Should it appear that relief is needed for the flow in times of

highest water, it can doubtless be found by the method advocated by the city engineer, namely, building of a relief sewer down Warren street, after it has been filled, branching from the Beaver creek channel, say at an elevation of a hundred feet above the datum plane, and either re-entering the Beaver creek sewer at Philip street, or else having a separate outfall to the river. When Myrtle avenue is graded between Swan and Hawk streets, it will probably be best to build a sewer down that avenue, which shall receive all the sewage to the north of it and deliver it into Beaver creek as low down as Grand street.

I can see nothing in the present condition of the Beaver creek sewer to prevent the extension of this sewer up the channel of Beaver creek. Whatever repairs or changes may be needed in that part of the sewer already constructed in no way affect the question of inclosing the remainder of the channel in a properly built sewer.

CONCLUSIONS.

It appears from the above facts that the health and lives of a large number of the citizens of Albany are imperiled by the nuisance existing along the valley of Beaver creek, from Eagle street up to Clinton avenue, these nuisances consisting in the exposure of large quantities of decomposing sewage along the channel of the stream, or in the valley and upon the adjacent slopes, the evil reaching its maximum in the sewage ponds and saturated flats in the Martinville valley; also, that the harmful influence of these nuisances probably extends over the grounds occupied by the Executive of the State, and over Washington park and surrounding drives, which constitute the principal pleasure-ground of the city of Albany.

The remedy is to be found only by filling the hollows to a sufficient height for proper drainage, and by providing closed sewers for carrying all the sewage streams. Unless proper measures are at once undertaken for accomplishing this end, the city of Albany must be prepared to take the natural consequences if cholera visits this country during the coming year.

Respectfully submitted,

JAMES T. GARDINER,

Chairman of Committee.

ACTION OF THE BOARD ON THE ABOVE REPORT.

On motion, it was unanimously

Resolved, That the polluted conditions described in Director Gardiner's report as existing along the channel and adjacent lands of Beaver creek are a nuisance dangerous to the life and detrimental to the health of not only the people living in the immediate vicinity of Beaver creek, but also of the inhabitants of a large part of the most thickly built portion of the city, including the Executive of the State, as well as frequenters of Washington park and the surrounding drives ; that the miasmatic emanations from these saturated lands and the decomposition of sewage may, owing to the prevailing southerly and south-westerly winds, be at times carried over a large section of the city with injurious effects that cannot be estimated.

Resolved, That in view of these facts, and of the further fact, that Beaver creek is one of the great natural water channels for the drainage of a large area of the city of Albany, the whole city is interested in the preservation of this water channel and its maintenance in a sanitary condition.

Resolved, That the above report of Director James T. Gardiner is hereby officially approved and adopted by the State Board of Health, and that it, with its accompanying maps and diagrams, be ordered printed and sent to the Governor of the State, with the following recommendations :

First. That the flats along Beaver creek, situated between Swan and Eagle streets, be filled up to such a height above the bottom of the sewer and with such a slope toward it as to secure their drainage into the main sewer, even at times when the sewage in the main rises to the height of four or five feet.

Second. That the lateral sewers and drains which flow toward Beaver creek and are now discharging on the slopes above the valley be connected with the main sewer by closed tubes, pipes or boxes, as the circumstances may require, and that no sewage be allowed to discharge on to the slopes or into the valley in an exposed condition.

Third. That Beaver creek, from Swan street to Lexington avenue, now an open sewer, be confined in a properly built closed sewer connected with the closed sewer already constructed both above and below these points.

Fourth. That that portion of the Beaver creek lying north of Western avenue and used as an outfall for sewage for the drainage of the district between Clinton and Washington avenues be made a

closed sewer, or else that the sewage be diverted to a sewer constructed in one of the public streets, the latter being preferable.

Fifth. That all pollution of the southern branch of Beaver creek, flowing south of Madison avenue and parallel with it, be stopped, and that the necessary sewers be built for carrying off the sewage that now enters this stream from the County hospital and other sources.

True copy from minutes of the State Board of Health, September 8, 1884.

FREDERICK CARMAN,
Acting Secretary.

PETITIONS.

The following was received by the Executive and by him transmitted to the State Board of Health for examination and report, on July 14, 1884:

ALBANY, *July* 11, 1884.

The attention of the State Board of Health is requested to and an abatement asked of the nuisance which has for many years existed in the city of Albany—in the fifteenth ward—neighborhood of Martinville. The entire drainage of 1,500 to 2,000 people is allowed to flow into two ponds, which have no outlet.

We ask that these ponds be ordered filled up to a level with the great sewer and the drainage conducted into it. The attention of the board of health of the city of Albany and also of the common council of this city has been called to this pestilential locality, but no proper movement has been made for its abatement.

If there be any place where the much dreaded cholera may find lodgment it is here, according to the reading of the admirable circular of the State Board of Health.

R. F. MACFARLANE,

142 Elm St.

LUTHER FRISBEE,

140 Elm St.

The following petition was subsequently received :

To the State Board of Health :

The Governor having already referred to your honorable body for investigation the complaint regarding the nuisance at Martinville, along the Beaver creek, we, the undersigned residents living in the locality affected, do most earnestly petition your honorable body to make your examination most thorough, and in view of the threatened invasion of cholera from Europe, to present us with a plan by which the evil may be remedied :

Names.	Residences.
George B. Hoyt.....	134 Eagle street.
Isaiah W. Stearns.....	190 Elm street.
A. Van Allen, Jr.....	164 Elm street.
Jas H. Kelly.....	209 Elm street
Fred. W. Ridgway.....	146 Eagle street.
Robt. Harris.....	196 Elm street.
D. A. Pierson.....	180 Elm street.
P. D. F. Goewey.....	98 Eagle street.
Joslin Nodine.....	206 Elm street.
Fred. G. Burton, per F. N. R...	148 Eagle street.
G. W. Luther.....	212 Elm street.
J. Aug. Goewey.....	142 South Swan street.
M. T. Howard.....	7 Hawk street.
Wm. Daly.....	11 Hawk street.
W. Serviss.....	123 Elm street.
Thos. Feeney.....	67 Jefferson street.
Michael Nolan.....	145 Elm street.
James H. Blessing.....	48 Myrtle avenue.
Edmund Stevens.....	50 Myrtle avenue.
Richard V. Stevens.....	166 Eagle street.
Geo. Stevens.....	137 Eagle street.
H. G. Stevens.....	50 Myrtle avenue.
Wm. Dwyer.....	157 Eagle street.
Richard MacNamara.....	41 Park avenue.
John Dobler.....	170 Elm street.
Albert Frederick Dobler.....	166 Elm street.
John Leopold.....	166 Elm street.
Wm. Striebel.....	198 Morton street.
Wm. Volk.....	133 Myrtle avenue.
Henry Hildenbrand.....	9 Martin street.
Adam Lahn.....	156 Dove street.
Heinrich Foerst.....	4 Martin street.
Jacob Bawer.....	12 Swan street.
John Keefe.....	82 Myrtle avenue.
R. F. Macfarlane..	142 Elm street.
Thomas McCabe.....	111 Jefferson street.
Chambers W. Isdell.....	178 South Swan street.
Josiah H. Gilbert.....	144 Elm street.
Wm. C. Allen.....	173 Elm street.
John F. Cuyler.....	176 Elm street.

Names.	Residences.
Robert Whitfield.....	173 Elm street.
Chas. A. Hinckel.....	2 Irving street.
T. Griesmann.....	216 Park avenue.
Fred. Hinckel.....	4 Irving street.
Herm. Brecktefeld.....	221 Park avenue.
Aug. Samuel.....	11 Martin street.
John Weber.....	3 Martin street.
F. Roshirl.....	5 Martin street.
John Stahf.....	12 South Swan street.
Chris. Schweiker.....	80 Myrtle avenue.
Ignatius Wiley.....	205 Elm street.
John S. Hutman.....	94 Jefferson street.
Elizabeth Zeller.....	39 Beaver street.
John J. O'Neil.....	105 Myrtle avenue.
Cor. Heffernan.....	137 Myrtle avenue.
Mrs. J. A. Connor.....	96 Myrtle avenue.
Mathew Rogers.....	62 Myrtle avenue.
Patrick Menahan.....	102 Myrtle avenue.
John Murphy.....	100 Myrtle avenue.
John Rork.....	125 Myrtle avenue.
John Grace.....	3 Hawk street.
Edw. Fennessy.....	94 Myrtle avenue.
William O'Neill.....	77 Myrtle avenue.
James H. Pratt.....	
John Fredenrich.....	86 Myrtle avenue.
William K. Martin.....	2 Hawk street.
John Dunn.....	88 Myrtle avenue.
Richard T. Colgan.....	165 Eagle street.
William F. Murphy.....	2 South Hawk street.
Patt Cleary.....	6 Prospect street.
Timothy Collins.....	155 Eagle street.
John Doyle.....	66 Park avenue.
Joseph H. McCarthy.....	63 Myrtle avenue.
Chas. N. Pratt.....	223 Park avenue.
James Ryan.....	137 Myrtle avenue.
Joseph Tommany.....	94 Park avenue.
Michael Sweeny.....	74 Park avenue.
Cornelius Moran.....	82 Park avenue.
Thos. S. Kelly.....	80 Park avenue.
Pat'k Ryan.....	80 Park avenue.

Names.	Residences
Thomas B. Douglas.....	78 Park avenue.
Richard Commerford	
Martin Raible.....	74 Park avenue.
W. R. Connick	74 Park avenue.
John J. Clancy	176 Eagle street.
Peter Fagan.....	76 Park avenue.
Geo. A. Floesser	67 Charles street.
Thos. Reilly	183 Eagle street.
Luke Messiah.....	183 Eagle street.
Michael Meehan.....	17 Prospect place.
John Obey	185 Eagle street.
John J. Riley.....	11 Prospect place.
James Aiken	9 Prospect place.
Robert Powers.....	7 Prospect place
Mr. Meehan	7 Prospect place.
James Eagan	6 Prospect place.
Royal Morse.....	8 Prospect place.
Andrew Flynn.....	1 Prospect place.
Patrick Burke	8 Prospect place.
Mr. Mee	7 Prospect place.
Wm. T. Foley	115 Myrtle avenue.
Samuel Cook	109 Myrtle avenue.
Pierce Powers.....	107 Myrtle avenue.
Michael Kenny	107 Myrtle avenue.
David Kearny.....	105 Myrtle avenue.
John Sweeney	110 Charles street.
Christopher Holligan.....	85 Charles street.
S. F. Slauson	105 Charles street.
John Brady	103 Charles street.
John Ryan	96 Charles street.
Martin Doody.....	87 Charles street.
James Finegan.....	77 Charles street.
Thos. Droogan	58 Myrtle avenue.
John Canavan.....	73 Charles street.
John J. Parker	73 Park avenue.
Ernest J. Grant.....	77 Park avenue.
William Schwick.....	77 Park avenue.
Thos. Loughlin	77 Park avenue.
Michael Carlin	85 Park avenue.
Lawrence Fagan	85 Park avenue.

Names.	Residences.
Mrs. M. Marshall.....	87 Park avenue.
William Tierney	87 Park avenue.
Lewis Cleary.....	94 Park avenue.
David Martin.....	74 Myrtle avenue.
Henry McGrath.....	74 Myrtle avenue.
Richard Shalley	72 Myrtle avenue.
George M. Keating.....	74 Myrtle avenue.
D. S. Lamb.....	70 Myrtle avenue.
Daniel Smith	70 Myrtle avenue.
John Shee.....	75 Myrtle avenue.
John A. Barry.....	165 Elm street.
Luther Frisbee	140 Elm street.
Daniel Harbeck	133 Elm street.
Solomon May.....	129 Elm street.
Chas. May.....	170 Madison avenue.
Henry C. Kinnear	46 Myrtle avenue.
Edward C. Ledger.....	200 Elm street.
M. C. DeRouville	145 Jefferson street.
J. S. Delehanty	79 Elm street.
Daniel Underhill	227 Hamilton street.
Thomas A. Burke	177 Elm street.
John Martin.....	182 Swan street.
L. H. Detmaker	139 Elm street.
John Cary.....	141 Elm street.
W. W. Williams	147 Elm street.
E. Francis.....	67 Myrtle avenue.
F. E. Plunkett.....	67 Myrtle avenue.
D. R. Stewart.....	78 Myrtle avenue.
Mrs. Russell	78 Myrtle avenue.
Mrs. T. Gardiner	78 Myrtle avenue.
Denis Fennessy	98 Myrtle avenue.
Wm. Kavanaugh	90 Myrtle avenue.
George Atkinson	88 Myrtle avenue.
J. Rowland Smith.....	4 Hawk street.
Thos. J. Dolan.....	117 Elm street.
Thos. J. Hinch.....	130 Eagle street.
Chas. L. Pease	12 Hawk street.
Charles T. Wilson.....	165 Swan street.
James Skillicorn	165 Swan street.
Joseph A. Conway	12 Jefferson street.

The following subscribers, although not residents of the immediate neighborhood, join in the above petition, because they believe the atmosphere of the whole city is contaminated more or less by the above nuisance.

Names.	Residences.
Allan Gilmour	36 First street.
Jeremiah Kieley.....	11 Broad street.

REPORT ON NUISANCES AT MARTINVILLE, IN THE CITY OF ALBANY.

JAMES T. GARDINER, Esq., *Chairman of Committee on Drainage, Sewerage and Topography:*

SIR — In accordance with your instructions I have made a careful examination of the nuisances at Martinville, in the city of Albany, that have been the subject of complaint on the part of those residing in the neighborhood.

Besides making use of all available data from existing maps and from records in the office of the city surveyor, Reuben H. Bingham, Esq., I have been compelled to make quite extensive examinations and measurements in the field to determine facts relating to the topography in the vicinity of Martinville and to the extent of the water-shed of Beaver creek, as well as to the sources of its contamination. I have embodied the facts ascertained in my report, which is herewith submitted with accompanying maps.

DRAINAGE OF BEAVER CREEK WATER-SHED.

The city of Albany is situated upon land which is divided by water-courses, running in a north-westerly direction from the Hudson river into a series of natural drainage areas. The valleys in which the drainage waters flow are, in general, narrow and quite deep. The most important stream that flows through the densely-built portion of the city is called Beaver creek. One branch of Beaver creek has been brought through Washington park by means of a sewer, and this furnishes nearly all the water flowing in summer. That portion of the creek taking rise in the extreme western part of the city, although possessing a large water-shed, becomes almost or quite dry in hot weather; the reason for this is that in the western part of the city the soil is extremely sandy and the streams have but a small inclination, hence most of the water is lost by evaporation and infiltration.

The western branches of Beaver creek receive but little contamination, as there are but few houses in the western part of the city, and the water of these branches is not offensive.

Near Robin street, however, the County hospital discharges the drainage of about forty-five persons, including the excrement from

patients affected with contagious diseases, into the creek, by means of an open ditch. The slaughter-house on Brevator street, in the western part of the city, does not sensibly pollute the stream, as its refuse is collected in a small hollow, from which it is removed at intervals.

The portion of the creek north of Washington park divides into two branches, just north of Western avenue and a short distance west of Quail street. The southernmost of these two branches is entirely open throughout its length, and it receives but little sewage. A large part of the flow of this branch is from springs at its head, near the intersection of the Boulevard and Washington avenue, where a small pond formerly existed. The Catholic orphan asylum furnishes this branch with a considerable amount of sewage, but it is the intention of the managers to divert this into the Western avenue sewer at an early day.

A number of houses west of Quail street, on Western avenue, also discharge their waste-water into this natural drain, although a sewer passes in front of their doors.

The northernmost branch of the fork, north of Western avenue, is exceedingly foul with the sewage of several hundred houses; yet it is in most places uncovered, and emits a very bad odor.

The general plan of the city, accompanying this report, shows the course of the various branches of Beaver creek referred to, and the location of the sewers which discharge into it. After leaving Washington park, the main sewer is joined by the one running along Madison avenue, and then passes down Lexington avenue to Myrtle avenue, where the brook, which is now exceedingly foul, is open as it passes south through the penitentiary grounds. Here six drains, carrying sewage from the penitentiary, and the Alms-house, enter the brook and add their share of filth.

The number of persons adding sewage to the creek, up to the point at which it leaves the penitentiary grounds, is estimated as follows:

From 857 houses along the line of sewers, reckoning five persons to each house.....	4, 285
Prisoners and other inmates of the penitentiary.....	700
Inmates of Alms-house and County hospital.....	75
Inmates of Albany orphan asylum.....	300
Inmates of Roman Catholic orphan asylum.....	138

Total number of persons.....	<u>5, 498</u>
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There are also about 200 in the penitentiary, and 200 in the Alms-house, whose excreta are used for fertilizing purposes, but who contribute their share of waste-water, from sinks, etc., to the creek.

It will be safe, therefore, to estimate in round numbers 5,500 persons as contributing sewage to Beaver creek before it reaches Delaware avenue.

It is estimated by the water commissioners that the average daily consumption of city water is 100 gallons for each inhabitant. It is very probable that this would be too large an estimate for those living on the water-shed of Beaver creek, west of Delaware avenue; but, as a considerable amount of water must be received from the overflow of the Washington park lake, 100 gallons per day for each person will certainly be a safe assumption.

Taking 550,000 gallons as the daily flow of sewage, the average flow is found to be about 85-100 of a cubic foot per second, which in the hours of maximum flow might be increased to about one cubic foot per second. A rough measurement in the penitentiary grounds gave the dry weather discharge as amounting to nearly three cubic feet per second; a large flow must, therefore, be received from springs, in comparison with that coming from drains.

East of Delaware avenue the creek is carried through a large sewer, to a point a short distance below Dove street, where the sewer discharges at the bottom of a rocky gorge, in which the stream descends rapidly. Near Swan street a steep fall of about 35 feet occurs, and at the bottom of this fall the stream again enters the sewer, to be no more visible till it reaches the Hudson river at the foot of Arch street.

In former times the unpolluted stream, after running through the rocky gorge and down the so-called Buttermilk falls, ran through a deep and narrow valley lying to the east of Swan street. This naturally beautiful valley has been converted into a hideous and repulsive waste, vast banks of ashes and refuse are visible everywhere, and the air is filled with vile odors from exposed sewage and filth of all descriptions. This valley, east of Swan street, is now known by the name of "Martinville."

THE MARTINVILLE SEWER.

The sewer constructed through the valley east of Swan street does not exactly follow the former course of Beaver creek, and at places its bottom is scarcely as low as the land adjoining. The sewer is

eight feet wide on the bottom, with sides of masonry rising vertically four feet, crowned by a semi-circular arch of four feet radius. The bottom of this sewer is flat and is formed of planks. At Swan street the valley has been filled in over the sewer to a depth of about 75 feet. The street grades, recommended by the city authorities, would eventually require a filling in of the whole valley till the sewer would be from 30 to 80 feet below the surface.

Man-holes are placed at intervals along the sewer, as shown in the accompanying map of the region of Martinville. The heights given on the map refer to mean low water of the Hudson river, the datum of the city surveyor.

The elevations of the tops of the stone covers and of the bottom of the sewer at each man-hole are as follows :

Elevation of top of stone cover of man-hole.	Elevation of bot- tom of sewer.	Approximate distance be- tween man- holes.	Slope per 100 feet of bottom of sewer.	
Feet.	Feet.	Feet.	Feet.	
58.61	39.19			Swan street man-hole.
		192	0.46	
55.72	38.30			Myrtle place man-hole.
		278	0.42	
56.90	37.15			High street man-hole.
		411	0.17	
54.95	36.45			Hawk street man-hole.
		378	0.09	
62.44	36.11			Eagle street man-hole.

The area of cross section of the Martinville sewer is about 57 square feet ; in summer the flow through it covers the bottom to a depth of only two or three inches. In spring the water pours through the sewer in such volumes that its capacity is said to be inadequate ; the iron covers to the man-holes at Swan street and Myrtle place are said to have been at times thrown off by the rising water, which, it is reported, poured out in torrents and united with the surface-water, flowing down the sides of the valley, to create a flood at the bottom. In the flat a large pond has formed, which has no outlet whatever, except the sewer ; for the filling at the eastern end of the valley, near Eagle street, effectually prevents the escape of the water by its natural course. The cause of the reported failure of the sewer to carry the flood-water of spring cannot readily be explained. The entire water-shed of Beaver creek, west of Swan street, is about 1,400 acres, or two and two-tenths square miles. It will be a very large estimate, to assume

that the sewer will ever be required to carry off two inches of rain and melted snow over this entire area within twenty-four hours; yet such an excessive flow would only amount to 117 cubic feet per second, and would be carried by the sewer, when full, if the mean velocity of flow was only about two feet per second.

It seems, therefore, that some cause exists for the backing up of water in the sewer. This may be due, either to a contraction in size of the lower portion of the sewer, to an obstruction from falling in, or to defective grades.

The surface-water, from the area lying to the east of Swan street, that finds its way into the sewer, would seem to be too small in amount to materially affect its capacity to discharge the waters west of Martinville. At times of flood in the Hudson river, when the water in the river is apt to rise from ten to fifteen feet above its height at mean low tide, the capacity of the sewer would be further diminished by the lessening of the hydraulic head of the sewer water.

The want of capacity of the main sewer, if it exists, certainly is an important matter, for if the sewer is inadequate, as is represented by parties living near to be the case, the inhabitants of Martinville must continue to submit to floods until, at some future time, the sewer, failing to withstand the pressure in its lower portion, bursts open, and relieves the inhabitants of Martinville, at the expense of those living nearer the river.

If the parts of Beaver creek west of Swan street, that are now uncovered, were inclosed so as to form a continuous sewer from the penitentiary to the river, any obstruction in the lower part of the sewer would be more dangerous than at present. The pressure due to floods has not yet been disastrous, since the man-holes at Martinville rise only from 18 to 26 feet above the bottom of the sewer, and the creek running through the ravine between Swan street and Delaware avenue can spread out laterally to some extent.

FAULTY CROSS-SECTION AND CONSTRUCTION OF ALBANY SEWERS.

In Albany a large proportion of the sewers are of a peculiarly antiquated and faulty character. The sewers shown on the accompanying map of Martinville and vicinity by distinguishing signs, as 12-inch, 18-inch, or 24-inch brick and stone sewers, are *square* in cross-sections with *plank bottoms*, brick sides and blue-stone tops. Sewers of this kind exist throughout the city, in about the same proportion to others as in that part of the city which the map covers.

The main fault in the *form* of these sewers is that the bottom is broad and flat; hence in dry times the flow of sewage will be retarded and much deposition of solid matter will occur. The gradients are so steep, in most cases, that the sewers are not very liable to become choked by accumulations of solid matter; but, as it is necessary for sanitary reasons that the sewers should always be as clean as possible the invert of all sewers should be curved, so that with a small flow of sewage the velocity will be still sufficient to prevent the deposition of matter held in suspension.

One of the most generally recognized facts in the construction of sewers is that they should be impermeable and that the invert especially should be quite smooth and able to withstand the chemical action of sewage, as well as the wear of storm-water. The impossibility of making plank sewer-bottoms impermeable is obvious, and the length of time they will withstand the wearing action of the sewer-water cannot be great.

A distinguished sanitary engineer has said: "The invert of sewers are particularly liable to wear from the erosion of the water and from the grinding action of the sand and solid matter transported over them. There are few brick sewers in London of greater age than fifty years which have not been underpinned and provided with new invert and otherwise extensively repaired, on account of the destruction which has taken place from the above-named causes."

Recollecting that the Beaver creek sewer has a plank bottom, it certainly seems a matter of questionable economy to have used wood for the invert of so important a sewer, and especially in one that was designed to be so inaccessible.

EXPOSED SEWAGE AT MARTINVILLE.

In former times Beaver creek could readily receive the Martinville sewage. The present sewer renders it impossible for drainage, discharged down the sides of the valley, to receive any outlet, except through openings provided in the sides of the sewer.

In the distant future, when Martinville is filled in as contemplated, the sewage must be admitted into the man-holes, as the main sewer will be entirely inaccessible for branch connections. At present the sewage from the sides of the valley in all directions pours down toward the sewer, and failing to find adequate means of escape, lies exposed in large pools at the bottom of the valley.

Much of the liquid portion of the sewage evaporates as it trickles down the hillsides or percolates the soil. Everywhere the air is filled with the vile odors of sewage.

From Hinckel's large brewery a torrent of sewage is poured down the ravine and enters the sewer just west of Swan street; this sewage is, in part, derived from the hollow lying just north of the brewery, which, taken alone, is a nuisance of the first magnitude. In this hollow, which extends from above Dove street about half way to Swan street, a quantity of sewage is exposed in shallow pools, giving forth a horrible stench.

East of Swan street the Park avenue sewer discharges the sewage of over 100 houses down the rocky termination of the ravine, while the waste-water from Dobler's brewery has eroded a channel near by in the clayey soil over which it flows.

Along Myrtle avenue, between Swan and Hawk streets, many drains discharge and the entire hillside is so covered with sewage that it is difficult to find space on which to walk with dry feet. All the sewage flowing down Elm street, from a point near Dove street, is carried through Hawk street to the brink of the hill, where the wooden box sewer, formerly existing, has been destroyed by decay and the pressure of the earth, so that the sewage now percolates the soil wherever it can make its way.* That part of the sewage flowing down the north side of the valley which has not been evaporated or deposited on the hillside or the flat bottom of the valley is finally taken into the sewer through temporary openings.

On the south side of the valley deep hollows have been eroded, in former times, by the water from springs and rains. Sewage now flows in these hollows and empties into a shallow pond, covering about two and a quarter acres in dry weather. Till quite recently the water in this pond was drained into the sewer from its eastern and lower end, but the weight of the material dumped over the drain has broken it in and rendered it useless. At present the water from the pond can only escape, if it does so at all, at its western end and enter the sewer near Hawk street; the bottom of the sewer at this point is quite as high as the bottom of the pond, and it is impossible to entirely drain the latter in the manner provided. The matter flowing into this pond is rank sewage, while there is scarcely any outflow.

A pond of the size and shallowness of this one, the average depth being only eight or ten inches in summer, will readily evaporate from eight to nine gallons per minute from its surface, during a warm day of summer. Thus the water is in great part evaporated, and the solid matter of the sewage is deposited upon the bottom of the

* The wooden box sewer has recently been rebuilt.

pond, forming a vile mass of corruption, from which gases and fetid organic vapors constantly arise.

The discharge from the Warren street sewer passes through an open ditch at the bottom of the valley for a short distance and enters the main sewer near Hawk street. Many of the houses in Martinville, on Warren street, Martin street, and Myrtle place, dispose of their drainage by allowing it to flow through an open ditch in the former bed of Beaver creek, till it enters the sewer at the Hawk street opening.

DANGERS FROM EXPOSED SEWAGE.

The most obvious nuisance at Martinville is the stench arising from the extensive area of exposed sewage, but the greatest danger arises from those products of organic putrefaction which are not very evident to the sense of smell; these organic vapors exist in all sewers, together with a variety of gases, resulting from the decomposition of the matters held in suspension or dissolved in the sewer water. In many modern sewers great precautions have been taken to secure thorough ventilation, and to absorb and destroy the products of putrefaction by the use of various disinfectants.

Ordinary sewage holds in suspension and solution from twelve to eighteen parts of organic matter in ten thousand; when such sewage is allowed to stand undisturbed it will give off various gases, at the rate of nearly thirty cubic inches of gas daily to each gallon of sewage, and will continue to generate gas at this rate for many weeks. A little consideration will enable one to comprehend the magnitude of the evil at Martinville, where sewage lies exposed by the acre, day and night, emitting its fetid effluvia and deadly vapors. The prevalent winds at Albany, during the summer months, are southerly ones, and the gases generated at Martinville are wafted at once into the very heart of the city.

Densely built blocks of houses, containing many thousands of inhabitants, are within easy reach of the noxious gases and offensive smells which are carried to them by the summer breezes. Costly residences have been built close to the edge of this polluted valley, and the State of New York has provided an executive mansion within less than a quarter of a mile of the center of Martinville.

PROPOSED REMEDIES FOR THE NUISANCE AT MARTINVILLE.

In suggesting a remedy for the evils at Martinville, the grading recommended by the city authorities must be disregarded, for this

will require a filling of such magnitude that it will not be attempted for many years to come, and any plan proposed must meet the present emergency at once.

The essential point, which must not be lost sight of in any system of improvement, is that excreta and other filth should be removed as soon as practicable, and in no case be allowed to lie exposed to the sunshine and winds in the immediate proximity of habitations.

The bottom of the valley should be filled in to the depth of several feet as soon as practicable, so that lateral sewers can readily discharge, without danger of a back flow when the main sewer is running nearly full. All open drains should be replaced by well-built and impermeable sewers.

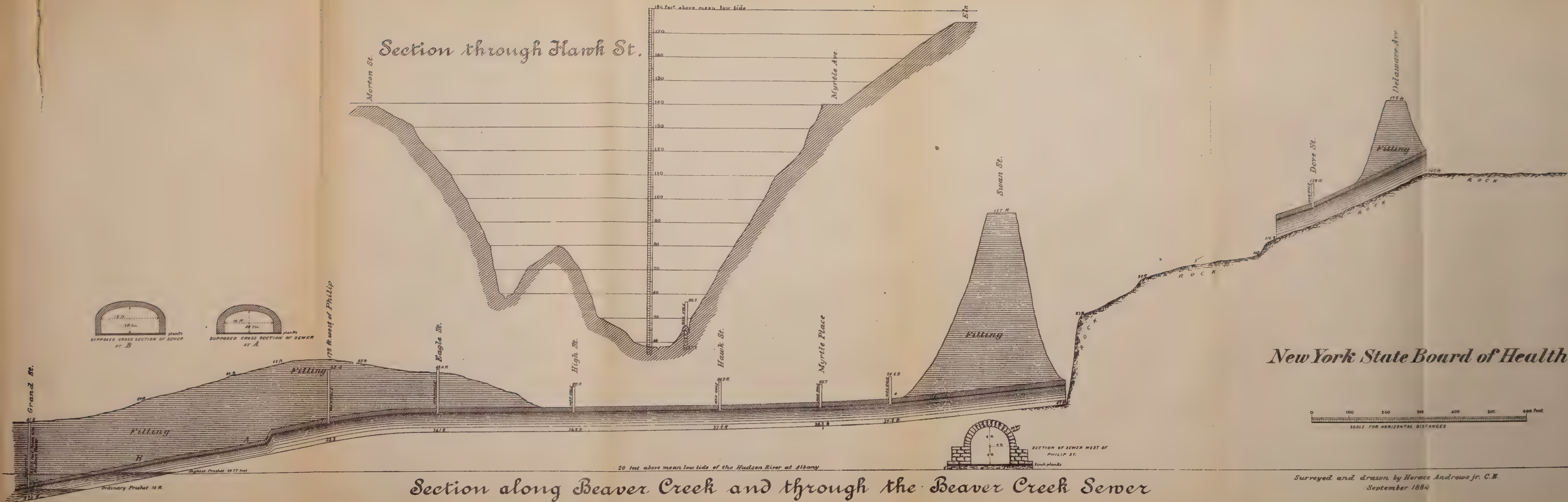
The capacity of the main sewer to carry the water of Beaver creek in time of flood should be carefully investigated, and if it is found to be inadequate in its lower portion additional outlet must be obtained for flood-water, otherwise it will be impossible to discharge sewage into the main sewer at Martinville in time of spring floods, and the danger of the sewer giving way under the internal pressure will always be imminent.

In the neighborhood of Martinville such additional sewers should be constructed as will carry away all the sewage now allowed to flow down the hillsides. The houses situated on Myrtle place, Warren street, Martin street, and all other places on the hillsides and near the bottom of the valley should have suitable drains provided, running to the main sewer and joining it. The inhabitants of houses along lines of sewers should be compelled to use them and in no case be allowed to discharge filth anywhere else.

The grading of Myrtle avenue should be completed from Dove to Hawk street and a sewer there laid. The Morton street sewer should be extended to Swan street, and a sewer should be built along Swan street, south of Warren street.

The sewer running along Park avenue and discharging on the east side of Swan street could be temporarily carried along the hill side and connected with the new sewer in Myrtle avenue. The drainage from Hinckel's brewery should enter the Park avenue sewer and the hollow north of the brewery near Dove street should be filled in or kept free from sewage and garbage in other ways.




In parts of the city remote from Martinville, wherever Beaver creek or any of its branches carry sewage, they should be led through properly constructed sewers.





Map
showing the
TOPOGRAPHY AND SEWERAGE
In the Vicinity of
MARTINVILLE
In the City of
ALBANY
1884
Scale 1 inch to 150 feet

NOTES

This map is from actual surveys and from former maps of the region.
Compiled and drawn by Horace Andrews J. C.E.
Contours are drawn in continuous red lines for every 10 feet of elevation. The plane of reference is Mean Low Tide of the Hudson River.
12 inch brick & stone sewers with plank bottoms are represented thus 
18 inch do do 
24 inch do do 
The green tint indicates water contaminated with sewage







NOTES.

Red lines show the location of Sewers.
The figures in the Hudson River indicate
the depth at mean low tide.
The green tint indicates water
contaminated with sewage.

EAST ALBANY

GROENBECKVILLE

N.Y. STATE BOARD OF HEALTH

MAP OF THE
CITY OF
ALBANY
NEW YORK

Showing the sewers and water
courses draining into
Beaver Creek Sewer

Scale 15000

1884



Many persons living near Martinville evidently prefer to discharge their filth in the manner most convenient to them, without any regard to their health or to that of the community. Even if additional sewers should be built the evils now complained of would still exist, unless the inhabitants should be compelled to use the sewers.

With proper sewers for removing the drainage of the neighborhood and due care taken to see that they are made use of, the evils now so apparent in the vicinity of Martinville would be done away with and a constant source of danger to the health and lives of many thousands of the inhabitants of Albany would be removed. It is to be hoped that the city authorities will see the importance of the improvements referred to, as well as the wisdom of prompt action, and soon take steps toward the suppression of the appalling nuisance that is the subject of this report.

Very respectfully,

HORACE ANDREWS, JR., C. E.

ALBANY, *August 26, 1884.*

REPORT ON THE SANITARY CONDITION OF THAT
PART OF PORT RICHMOND DRAINING INTO THE
SO-CALLED PORT RICHMOND DITCH.

To the Town Board of Health of Northfield:

The Town Board of Health of Northfield on the 7th day of May, 1884, made application to the State Board of Health to examine and report on the sanitary condition of an open drainage ditch running through the village of Port Richmond, and known as the Port Richmond ditch.

Director Gardiner, the chairman of the committee on drainage, sewerage and topography, and Dr. Alfred L. Carroll, the secretary of the Board, visited Port Richmond on the 10th of May, and in company with Dr. Walser, the health officer of the town, made an examination of the ditch in question, and of the condition of the premises in its neighborhood. The results of their observations and their conclusions were reported to the State Board of Health at the annual meeting, May 14, and the committee were directed to prepare and transmit to the Town Board of Health a report embodying their observations and conclusions.

In accordance with this authorization, the committee respectfully make the following

REPORT.

Topography. — The Port Richmond ditch heads west of Elm street and runs north-east across Elm and Phebe Ann streets to a point half way between Phebe Ann street and Church road; thence it runs nearly northward parallel with Church road and crosses under the Shore road and the buildings which stand on the street, and empties into the Kill-von-kull. The latter part of the course of this ditch is within the business center of the village.

The ditch is a very shallow one and has comparatively little fall. There being no sewers, this open ditch receives the surface water from quite a large area. The tract draining into the upper part of the ditch includes all Phebe Ann street, except perhaps two hundred feet near the Shore road, and some portion of Elm street and Grove avenue. A part of the region is quite thickly settled, being built upon with small houses. In the absence of a topographical map, it is difficult to give the area of the natural drainage basin of this ditch, but it is sufficiently large to cause a strong flow of water after rains.

At the time of Mr. Gardiner's and Dr. Carroll's visit a stream several inches deep was flowing in the ditch. The soil of this drainage basin is clay; and the slopes down to the ditch, which occupies the natural position of a brook, are quite marked though not steep.

Sanitary condition. — A few years ago complaint was made of this ditch on account of its filthy condition, due to the privies placed over it. These have now all been removed. One or more privies, however, stand so near the ditch that the contents when dissolved by heavy rains leach into the ditch, and one or two houses near the north end of Phebe Ann street, where they have water-closets, drain the house sewage into the ditch. This sewage enters the ditch just west of Phebe Ann street. Between its head and Elm street the bed of the ditch is quite clean, but below Elm street the bed becomes fouler and fouler, until after passing Phebe Ann street, there is quite a deep deposit of mud and animal and vegetable organic matter undergoing process of decomposition, which makes it most offensive when exposed to the air.

This organic matter comes from several sources: *First*, from the water-closets which are allowed to drain into the ditch at Phebe Ann street, and from the leaching of the privies of at least two houses between Phebe Ann and Elm streets. *Second*, from the slops and house refuse either thrown directly into the ditch, as is done between Elm and Phebe Ann streets, or thrown into the gutters of Phebe Ann, Elm and Grove streets, and washed down by the rains into the ditch, where the greater part of it accumulates. All surface filth of this neighborhood which can be dissolved and carried by water, and which naturally runs off from the impervious clay soil, finds its way to the Port Richmond ditch. The result is a foul deposit of organic matter, which is alternately saturated in times of rain-fall, and exposed to the sun in times of drought.

The people of the region are drinking well water which, during

the early part of May, was found to stand within two or three feet of the surface of the ground, and to fluctuate greatly with the rains. The water contains an unusual amount of chlorine which here is evidence of sewage contamination.

In examining the cellars of some of the houses, the ground water was found to stand within two inches of the bottom of the cellars. From the examination of the relative position of the privies and the wells there can be little doubt that the wells are more or less contaminated with animal excreta or the slop water from the houses. The north-western corner of a house standing on the south side of the ditch on Phebe Ann street was found to be in a pool of liquid filth.

In one of the rooms of the basement floor lay a patient, suffering from a most violent attack of diphtheria. Diphtheria had also occurred in a number of other houses in this neighborhood.

The committee find that the people living in this district (and it is to be understood that the Shore road is excluded from these remarks) are drinking contaminated well water, are living on soil more or less saturated with filth, and in the neighborhood of a ditch lined with a foul accumulation of animal and vegetable matter, undergoing decomposition. These conditions are calculated to impair the general vitality of the people of the district, to produce and sustain specific filth disease, and to render the community liable to the outbreak of a severe epidemic. The saturated condition of the sub-soil also tends to lower the vitality of the people, and to produce malarial fevers. We therefore consider the Port Richmond ditch a nuisance in its present foul condition. No proper provision has been made for the removal of the filth of this part of the village, and the health of the people is endangered by drinking from contaminated wells.

Remedy. — To correct these unsanitary conditions the only means are to supply to the people wholesome water from some pure source, and to compel the removal of all animal and vegetable filth in the neighborhood of the dwellings. The removal of the filth can practically be accomplished in only one way; that is, by a system of sewers, with which every house should be connected. A cheap system of six-inch pipe sewers with flush tanks would carry away all the excreta and waste-water from the houses if there was a proper supply of water for this district. At present there is neither water supply nor sewers.

In the absence of the necessary supply of water for domestic uses and for carrying away the filth by water-carriage, a part of the latter can be removed by what is known as the tub or pail system. With this system each privy has under the seat a water tight box or half barrel or pail, into which the human solid and liquid excrement is thrown. A small amount of ashes is added several times a day as a deodorant. When full the tub or pail may be removed to some cultivated field and the contents spread upon the ground for manure, or it may be used in the garden if properly mixed with dry earth. By this means the human excreta are prevented from saturating the ground with animal filth, a process which is now going on in Port Richmond. The weakness of the system is, that no method is provided for removing the waste water of the house which has become fouled by domestic use. In the case of Port Richmond the slop water would have to be thrown into the street gutters. By this means the wells might be somewhat protected from contamination. *Third.* — A third system is that of privy vaults made tight by cement into which the excreta are thrown with ashes as into the tubs or pails before spoken of. These vaults, being much larger than the tubs, are likely to be used from six months to a year without cleaning, and are for that reason more objectionable than the pail, which, if properly managed, should be emptied once a week. This system of cemented vaults is only better than the ordinary privy in that it prevents the saturation of the soil with animal excreta, and thus protects the wells. In the vault plan, also, no provision is made for the waste-water of the house which must be thrown into the street gutters, from which part of it must flow down into the open ditch.

While the committee lay before you these three plans, the first, that of water supply and sewerage, is the only method which properly provides for the removal of all sewage from the district. The pail system or the cemented vaults must be looked upon as temporary expedients; and of these two expedients we consider the tub or pail system decidedly preferable.

As to the Port Richmond ditch, it should be kept open for the drainage of the surface water falling upon this natural drainage basin. But it should not be left in its present condition. The foul deposit along its channel should be dug out and removed from the neighborhood, and the bed of the channel should be paved with cobble stones like a gutter, so that it can be kept in a clean and wholesome condition. The advantage of keeping this ditch open as a drain for surface water is that the sewers, when built, may be made

very small and adapted to carry sewage only. One of the most important advantages of sewers to this locality will be the thorough underdrainage of the ground, and the lowering of the level of the ground-water which now stands close to the cellars at certain seasons. In the trenches with the sewers should be laid agricultural tile drains, and these should be carried up to the houses in the same trenches with the house connections, so as to secure the underdrainage of the soil about the dwellings.

While your Board of Health may not be able to persuade the people as to the immediate importance of water supply and sewerage, it certainly should be possible to prevent the saturation of the soil with human excreta by stopping the use of the ordinary privy pits, and insisting upon tubs or pails being placed under the seats, and by proper supervision compelling the frequent removal and emptying of the receptacles. The cleaning and paving of the Port Richmond ditch is in our judgment the only method of putting it into a sanitary condition; to keep it wholesome will require cleaning at intervals more or less frequent.

*Committee on Drainage, Sewerage
and Topography.*

JAMES T. GARDINER,
Chairman,
ERASTUS BROOKS,
GEORGE W. COOKE,
EDWARD M. MOORE,
President,
ALFRED L. CARROLL,
Secretary.

REPORT.

To the Trustees of the Village of Bath, Steuben County:

Your Board having represented to the State Board of Health, that, during the past year, there has been an epidemic of typhoid and other fevers in the village of Bath and that it still continues, and having urgently requested this Board to immediately examine into the causes of this serious illness, and suggest, if possible, some remedy, Director James T. Gardiner, chairman of the committee on drainage, sewerage and topography, and Dr. Alfred L. Carroll, Secretary of the Board, visited Bath on the third and fourth of April, and carefully examined into the nature and distribution of the disease, and its probable cause and remedy. The facts and conclusions reached by them have been submitted to the standing committee on drainage, sewerage and topography, who have full power to speak for the Board on this question, and the committee report as follows:

REPORT.

Dr. Carroll, on the evening of April 3d, met by appointment all the physicians of the village, and after hearing all the facts concerning the history and nature of the disease, came to the conclusions stated in his report, which is appended. Dr. Carroll says:

“As regards the nature of the present illness prevailing in the village, I find, after consultation with nearly all the local physicians, that there exists much diversity of opinion. All agree that endemic fevers have been increasingly rife, especially within the past year, but whilst some are inclined to class most of their cases as “bilious,” “gastric,” or “typho-malarial” fevers, with only occasional examples of marked typhoid, others report a great preponderance, or even exclusive occurrence, of enteric fever. From careful inquiry and analysis of symptoms, I satisfied myself that, at the smallest computation, fifty-two cases of genuine enteric fever have arisen since May of last year, and I think that this estimate might probably be largely

increased. According to the statements of several physicians, "fevers" of one kind or another have affected about ten per centum of the population, with a decided proclivity for young adults. I learn also that diarrhœal ailments of minor grade have for a long time been of frequent occurrence. On the other hand, I am informed that in the vicinity of ponds with much fluctuations of level, and particularly in the neighborhood of a railway construction through the marsh above mentioned, fevers of a noticeably paroxysmal type and dysentery have been observed. It seems probable, therefore, that, as in many similarly situated places, the cases of "fever" comprise some adynamic remittents of malarial origin, many instances of true typhoid, and an indeterminate range of malaria plus filth-poisoning vaguely classed as "typho-malarial."

As far as I can learn, isolated sporadic cases of enteric fever have been observed at intervals for a number of years past; but it was not until last May that the disease showed a marked tendency to spread. Even then its extension did not seem to proceed from any determinable foci, but cases arose almost simultaneously at different points. The practice of one physician appeared to point to a progression along a certain street in the direction of the usual flow of the ground-water; but from others I learned of preceding cases at the opposite end of the village. A number of instances happened in and about the principal hotel, but the domiciliary conditions of this establishment were better than ordinary, save as regards its situation in a closely built neighborhood with a multiplicity of surrounding privies. No distinct history of importation of infection could be obtained; the milk supply was free from suspicion; and at the Soldiers' Home I was assured that no typhoid fever had existed since its foundation. A cottage about a quarter of a mile above the built-up part of the village, and having a privy close to the river bank, was occupied temporarily about eighteen months ago by a party of Italian railway laborers; but although there were among them some cases of diarrhœal disorder, the physician who attended them informed me that none were regarded by him as of specific character."

The character of the cases of true typhoid fever, the times of their occurrence, and their distribution throughout the village indicate a somewhat general and constantly acting cause as the origin of the disease.

The history of typhoid epidemics has shown that a very large majority of them are primarily due to filth poisoning of the water

supply. So commonly has this proved to be the cause that suspicion naturally rests at once upon the water supply of any body of people who are afflicted with this disease.

The people of Bath are supplied with water from wells, which on the average are from twelve to fifteen feet deep to water. At this distance below the surface there appears to be water under-lying all the main part of the village. A careful examination was made by Mr. Gardiner, the chairman of the committee, into the probable source of supply, of this water stratum under-lying the town, and the conditions under which it exists. An examination was also made of the topography and surface geology of the surrounding country. It was extended to the Soldiers' Home lying about a mile west of Bath. The investigation also included the country a mile south-east of Bath to Lake Salubria.

In order to thoroughly understand the sources and movement of the sub-soil water in the village of Bath it is necessary to know the topography and surface geology of the surrounding region.

Topography. — The village of Bath lies in the valley of the Conhocton river, at an altitude of about 1100 feet above the sea. The river runs from north-west to south-east, the village lying on its north-eastern side, on a gravel terrace thirteen to fifteen feet above the stream. The valley of the Conhocton is eroded out of the nearly horizontal strata of the Chemung shales. The hills about are formed of this group of rocks and their tops are of quite uniform level, 600 to 800 feet above the valley. After the erosion of the Conhocton valley in ancient geological times, its bottom was refilled with gravels making terraces of various heights above the stream. Some small beds of clay were also deposited with these gravels; but there appear to be no continuous beds of clay in the deposit. The upper terrace of this region is from fifty to sixty feet above the river, and forms the divide between this valley and that of Crooked lake, while the lower terrace on which the village stands is about thirteen to fifteen feet above the stream.

A layer of loamy material several feet thick covers the surface of the terrace; below this the formation is of coarse and fine gravel, some of it very coarse indeed. It is said by those who have seen the wells dug in former times in this terrace, that when water is reached there is a stratum of fine gravel which flows like quicksand and which often runs into the wells almost as rapidly as it can be bailed out.

The Soldiers' Home stands on a gravel terrace somewhat similar
[Sen. Doc. No. 47.]

to that at the village of Bath, although on the opposite side of the river. Wherever excavations have been made for the recently built Delaware, Lackawanna and Western railroad, water was encountered about the level of the river; even when the borrow pits were a thousand feet from the stream. Such excavations occur about one-half mile above the village.

The main streets of Bath run nearly east and west and north and south. The thickly settled part of the village is a little more than a mile long from east to west and about a half a mile broad. Near the western end of the village is a dam, by which the water of the river is set back into a series of ponds called Long pond and Back pond which really surround this end of the village. The surface of these ponds is only about three feet below the central part of the village. They are, therefore, about eight to ten feet higher than the water in the wells of the village in time of low water.

The terrace on which the village stands slopes both south-easterly or parallel with the river and also slightly toward it.

Sub-soil water. — The testimony of a number of citizens was taken respecting the circulation of the water in the soil beneath the village. Experienced well diggers, and those who had observed the water in newly dug wells agreed in their statements that the water always enters the wells from the western side, and flows toward the east. There have not been many recent observations made upon this, owing to the fact that driven wells are now generally used throughout the village.

The statements regarding the easterly or south-easterly flow of the water in the wells were made respecting all parts of the village; but the most perfect proof of the existence of an easterly flow of water was the testimony given in an action against the gas company, May, 1883, the complaint being against the old gas-works, located on the north-east corner of Pine and William streets. A number of complainants, whose property and houses stand along the north side of William street as far as Liberty street, alleged that the water in the wells was discolored and given a bad taste and odor from the refuse material of the gas-works, which the gas company were in the habit of burying in the ground in their lot on the corner of Pine and William streets.

In this action it was clearly proven by specimens of water taken from the wells in question that in case of high water either in spring or autumn, or during summer storms, the wells for at least 800 feet to the eastward of the gas-works would be contaminated by material

carried through the soil from the gas-works, the water showing very marked discoloration and having a strong taste and smell. The facts were so clear that the gas company settled the claim against them and moved their works. It appears, from the evidence given, that gas refuse buried in the ground would be carried down from the surface into the general water-bearing stratum, and spread thence to the eastward quite rapidly. No complaint was made by the people to the west or to the south. The direction from the gas-works to the house of Mr. R. Campbell, who was the most distant complainant, is almost due east, and the distance is 800 feet from his well to the gas-works. Since the visit of the committee information has been received that the gas refuse contamination has been observed in the wells on the south side of William street, south-east of the gas-works lot, and also in the wells on the east side of Liberty street, 1000 feet from where the old refuse is buried. The testimony of Mr. Robert M. Lyons, concerning the action of the well at his old house on Haverling street, seems to prove not only the existence of an easterly current but also that the sub-soil water has at times a direct dependence on the large ponds at the west end of the village. Mr. Lyon is an educated engineer and his observations are undoubtedly trustworthy. They were continued through the seventeen years that he occupied the premises on Haverling street. The house lies nearly due east of the north ends of Long and Back ponds. He observed that when these ponds were drawn down for any length of time, say from five days to a week, in summer, the water in his well was very much lowered; and the same was true of the next well to the south of him. Mr. Lyon's house was situated on the upper terrace some forty feet above the center of the village. He had to go nearly sixty feet down in the gravel to get water, so that the water in his well was almost at the same level as that in the village. In the absence of a complete system of leveling it is difficult to determine, with precision, this question of the uniform level of the water under the whole village. But the levels, kindly taken for us by Mr. Robert M. Lyon, the village surveyor, show that there is very little difference in the sub-soil water-level, and that this level is about that of the water in the river. Mr. Lyon's report is appended.

It also was the common testimony of witnesses that in times of flood, when the river rose to an unusual height, the water would appear rising through the gravel in the bottoms of the cellars of the stores and houses in the town. Some witnesses testify that the

water would boil up out of their driven wells and overflow the cellars. It was clearly shown that these waters did not come from the surface, but rose from the gravel in the bottoms of the cellars. When the water in the river began to subside, a current would sometimes be perceptible in the cellars, the water flowing to the south or south-east. An experiment was actually made to test the direction of the current by Mr. Ruggles, now Superintendent of Public Instruction.

Throughout the main part of the village, water is always found when a well is sunk to the proper depth. It is also a matter of common observation that no matter how hard it rains the water almost immediately disappears from the surface, sinking through the soil.

From these facts it appears clear that a sheet of water is flowing from west to east under the village of Bath through the gravels, and that in times of high water this current may be reversed, and the water backed up so as to rise in the cellars of the houses; and that in times of rain the water passes easily from the surface downward. There is, therefore, free, unhindered circulation of water horizontally under the village, and also vertically through the soil, the water going down from the surface to the water-level below, or that water-level rising until it reaches the cellars. It follows also, from the facts concerning the gas company, that the gravel is so coarse that even coloring matter may pass through it 1000 feet. The soil has, therefore, very little filtering power. It is not possible to identify the sources of all the sub-soil water, but, from the testimony given regarding the fluctuation of the well of Mr. Lyon and his neighbor, as well as from the topographical position of the mill-ponds at the west end of the village, it appears highly probable that a large part of the water comes through the gravels from the river and ponds which, at the upper end of the village, are almost at a level with the surface of the ground. The probability is that water from these ponds and from the river flows readily through the gravels under the town toward the east. In other words, that part of the Conhocton river is flowing in its bed and part is flowing in the gravels along its north-eastern bank under the town.

Pollution of water supply.—The sub-soil waters beneath the village are, undoubtedly, greatly polluted, and this pollution is from two sources. The first is probably so small a factor that it can hardly be said to be harmful. The second is very dangerous. The first cause of pollution is

The sewage from the Soldiers' Home. — The Soldiers' Home stands a mile above Bath on the opposite side of the Conhocton river. It has an ample supply of pure water from the springs on the hills. It has also a system of sewerage. The greater part of the sewage of 650 people is emptied into the river a mile above the village. The premises of the Soldiers' Home were carefully examined. There are water-closets in the hospital and in the dormitories. Those in the hospital are used during the day by about 115 persons; those in the dormitories are kept locked during the day and used only at night. Soldiers not in the hospital use, during the day, an outside privy that is worked upon the tub or pail principle; that is, the excrement falls into receptacles where it is deodorized by the use of ashes and afterward carried off to a distance. All the urine, however, passes into the sewers. The amount of organic nitrogen passing from the human body in the fluid excrement is about nine times that in the solid. As a matter of chemical analysis of sewage, it has been found that it made very little difference in the composition of the sewage of a large population whether it contained solids or not. The sewage, therefore, which passes from the Soldiers' Home into the river, containing, as it does, all the excrement of over 100 persons and the fluid excrement of 650, together with all the slops and waste water, may be fairly considered equivalent to the sewage of 600 people.

An inspection of the mouth of the sewer showed that a large amount of solid organic matter of various sorts was passing into the stream. The foul bandages from the hospital patients are not allowed to go into the sewer, but are thrown into a refuse heap at a distance from the building.

The records of the institution show, that there have been no typhoid fever and no cases of malarial fever originating there. The system of ventilating the wards and dormitories is not satisfactory and the rooms are too crowded, but otherwise the institution seemed to be in a sanitary condition.

The water of the Conhocton river is, therefore, being fouled to the extent of the admission of the sewage from the Soldiers' Home a mile above the village. This water passes down the river and the larger part of it goes either over the mill-dam or through the mill-race, but some goes into the ponds and forms a part of the sub-soil water of Bath. What proportion of it becomes sub-soil water it is not possible to say; but the amount of sewage that can reach the wells of Bath from the Soldiers' Home is as nothing compared with the quantity which comes from the second source,

The village sewage.—The sewage of the village of Bath including the *excreta* from the human body, the waste water and slops, the drainage of manure piles and all the accumulated filth of a population of over 3,000 people, is draining down through the porous soil of the village into the sub-soil. The excrement and waste water is now disposed of in privies and cess-pools, from which it immediately drains away into the sub-soil. After rains all the surface filth of the village that is capable of being dissolved passes down with the rain water through the gravel till it reaches the water-level. The very flat character of the surface of the village insures that very little water shall run off. Much the greater part sinks down through the ground to the water-level, carrying with it every sort of soluble filth. The more water that is used in cess-pools and water-closets the more widespread is the action of the filth. In cases where the leaders from the house roofs have been carried into the cess-pools the effect undoubtedly has been to more thoroughly dissolve the filth and carry a greater quantity of it into the sub-soil. Whatever filth of any kind is dissolved either on the surface of the ground or in the privies or cess-pools in the village of Bath, is passed down into the sub-soil water and is drunk by the people in a more or less diluted form. The case of the gas-works shows clearly that the soil has practically no filtering power. Where coloring matter passes dissolved filth will pass. Wherever water will flow filth will go with it. There is really no separation between the cess-pools and the wells of Bath from which the people are drinking.

Even were the gravel very much finer than it really is there would be no safety in using this water. The experiments of Prof. Raphael Pumpelly, made for the National Board of Health, showed conclusively, that bacterial infection would pass through a hundred feet of sand so readily that, he says, "sand interposes absolutely no barrier between wells and the bacterial infection from cess-pools, cemeteries, etc., lying even at great distances in the lower wet stratum of sand."

In the case of Bath, however, the free passage of polluted water through the soil is clearly shown by the action of the gas-works, and it is not necessary to appeal to the many laboratory experiments by which it has been shown that gravel and sand have no power to filter out the bacterial infection from polluted water. There can be no reasonable doubt, that all of the sub-soil water underlying the village of Bath is polluted, and that it not only contains ordinary filth, but that in this filth there has been planted the specific poison

of typhoid or enteric fever; so that the drinking water of the village doubtless contains, in addition to the usual supply of sewage, the specific poison of typhoid fever.

Pollution of soil. — The sub-soil of Bath from its very porous character is, as we have shown, polluted by the passing down from the surface of all the sewage and filth dissolved by storm water on the surface, in addition to which is the specific poison of typhoid fever. The effect of this pollution of the soil is to pollute all the air that is contained in the interstices of this coarse gravel. A soil like that which underlies Bath contains air to the amount of thirty to fifty per cent of its volume.

This air is called the ground-air. Whenever houses are heated the effect is to draw the ground-air from the cellars up into the dwelling. It comes out into the basement contaminated with whatever bacterial life there may be in the soil, and this passes through the houses to be breathed by the people; or, where there are cisterns in the cellars, the water of the cisterns is liable to be contaminated with the bacterial life in the ground air.

There can be no doubt that the ground-air under the village of Bath is seriously contaminated with general filth and specific enteric poison, and that this is liable to pass into any or every house in the village, carrying the seeds of disease with it. The ground air is not only drawn into houses by heat, but with every rise of the sub-soil water it is forcibly expelled from the ground into the houses and the streets. This air comes loaded with polluted moisture and may be either the cause of typhoidal or malarial fevers, or of dysenteries, diarrhœas and consumption.

It is by no means difficult to explain the cause of the serious disease in the village of Bath; the only difficulty is to explain why all the citizens are not ill; and this question was constantly asked by those who have thus far escaped. It is well known that there is in certain systems the power to resist and destroy the germs of disease. It is a matter of common observation in every epidemic. One of the most remarkable cases is cited by Dr. Carpenter, from the records of the British army in India, where nineteen soldiers drank from a vessel that had been contaminated by the rice-water discharged from cholera patient. Five of the nineteen were within thirty-six hours seized with cholera, but the other fourteen were unaffected, having the power to resist and destroy the poison. The people of Bath are undoubtedly drinking sewage, but a certain number have power to resist its effects. This power of resistance varies

greatly ; and those who have drunk the polluted waters without harm thus far, may, in a moment of weakened vitality, become suddenly susceptible to the poisonous character of the water supply, and the foul air from the soil which is, in its nature and effects, like the air from a sewer.

While giving great weight to the polluted character of the water supply of Bath as the cause of disease, we cannot fail to recognize the very unwholesome condition of the *soil* itself. The rise and fall of the polluted ground-water in such a porous soil makes the soil itself a most perfect breeding ground for all zymotic poisons. These are carried out of the soil by the currents of air, and being taken into the lungs are often as capable of producing disease as when taken into the stomach with water.

We are, therefore, of the opinion that both the typhoid and malarial fever of Bath are due to the condition of the gravel soil which underlies the village, and to the polluted water contained in the gravel ; that this water and soil have become a breeding place of disease, and that the typhoidal poison and malarious miasms are carried into the stomach and lungs of the people of Bath by the drinking water, and by the air which is constantly rising from the soil through the houses. On account of the pollution of the air all the cistern water is liable to be affected ; for it is well known that cistern water exposed to an atmosphere containing zymotic poisons readily becomes contaminated by absorption. Not only is this the case, but much of the impurity of the atmosphere about the town and all of the foul matter in the dust which has settled upon the roofs of the houses is carried into the cisterns in time of rain-fall. The cisterns are liable, therefore, to be polluted both by absorption and from the dust and impurities of the air that are dissolved by the rains. Much of this matter being in solution cannot be removed by the process of filtering. The cisterns themselves may thus become the breeding places of low dangerous organisms.

In view of these facts the committee are of the opinion that the unhealthfulness of the village of Bath is not only unlikely to permanently decrease, but, while the prevalence of disease may fluctuate, the town will probably become more and more unhealthful.

Means should, therefore, be at once taken to provide an efficient remedy ; but in the mean time many deaths may occur before the permanent remedy can be applied. In view of the imminent danger to the life and health of the citizens of Bath, the State Board of Health makes the following

RECOMMENDATIONS.

For temporary relief.—That the people drink only boiled water. The boiling of water destroys in a great majority of cases the poisonous organic life which it may contain. The chairman of this committee has himself seen twenty people poisoned in one day by drinking water from a polluted well, who afterward drank this water with impunity when it was boiled and aerated. It is, therefore, advised that the people should use only boiled water which has been aerated either by passing it through a filter of alternate layers of gravel and charcoal or by the addition of quantities of ice. The boiling of water drives out the air which it contains, and the drinking of water which is thus deprived of its air is supposed to create disturbance of the digestive organs. Water in passing through a filter of sufficient length regains its natural amount of air. It may regain its air when sufficient ice is put in. It is, however, important that this ice should have been taken from a pure source, for it is now well known that ice cut from polluted waters may carry the germs of disease and cause serious epidemics.

This drinking of water which has been previously boiled and aerated is, however, a mere partial and temporary relief. The village is underlaid with one great drain, and the air is rising in and around every dwelling. The board, therefore, advises that there is but one permanent and thorough remedy for the unwholesome condition of the village of Bath.

Permanent remedy.—The excellent sanitary condition of the Soldiers' Home, where they have a pure water supply and thorough drainage, is sufficient evidence that there is nothing in the locality of Bath necessarily unhealthful. In the judgment of the board it requires only an ample supply of pure water and a thorough system of sewerage and sub-soil drainage to make Bath one of the healthiest villages in the State. We, therefore, urgently advise that no time be lost in executing these important improvements.

To introduce water without a system of sewerage and drainage would, in our judgment, be a great mistake. The people would in this case use a largely increased amount of water, all of which would be converted into sewage, and would be thrown into the soil so that still further pollution would take place, and the sub-soil of the village would become one great cess-pool, the surface of which would rise and fall with the seasons, coming, sometimes, up to the very floors of the cellars. The air of the dwellings would be probably more poisoned than it is now, and it is uncertain whether there would be any large relief from disease.

If, however, water is introduced and sewers are built to carry off polluted water and agricultural drain tiles are laid in the trenches of the sewers, the effect will be to give wholesome drinking water, to purify the soil, and keep down the sub-soil water. The storm-water falling on the surface of the village will pass through the gravel and out of the sub-soil drain, thus cleansing and purifying the ground beneath the village. This free current of pure rain water passing through the soil and out of the sub-soil drains would probably soon cleanse the gravel of the filth that is now accumulated, and render the ground beneath the village wholesome. Such action would be greatly facilitated by the opening, cleaning and careful refilling of all the vaults and cess-pools in the town.

Mr. Gardiner examined into the available sources of water supply, near the village, and also the general level of the town with regard to the construction of sewers.

Water supply. — There are two available sources of water supply for Bath, without considering the use of the river water. One is a lake called Lake Salubria, about a mile east of the center of the village. Its surface lies, probably, at a lower level than the village. The lake has no apparent inlet or outlet. It is about a third of a mile in diameter and quite deep. *

The general character of this water is different from that contained in the gravels reached by the wells in the village and suburbs. It possibly comes from some deeper and purer source.

It would require a detailed and careful examination of the lake and surrounding country to determine the source of this water. There are two objections to its use as a water supply to the village of Bath. One is the fact that it lies at a lower level than the village and would require to be raised by pumping.

The other and more important objection is the fact that on the west side of the lake is a gravel terrace about forty feet above it, and this plateau extends to the village of Bath which really rises onto the western end of the plateau. A number of houses have already been built between the village and the lake. Growth in this direction has been retarded by the fact that it was difficult to obtain water on this gravel terrace, the wells here being some forty to sixty feet deep, showing probably that they go down to the same water stratum which is reached in the village. It seems, therefore, highly probable that the water stratum which underlies the village extends under this plateau and reaches Lake Salubria.

However this may be it is quite certain from the nature of the

soil that Lake Salubria is liable to be polluted by the washing through the coarse gravel of whatever filth comes from the dwellings on the plateau above it; and with the introduction of water it is not improbable that there will be a steady increase in the number of houses on the terrace above the lake. At the same time it is quite possible that the foul waters which pass under Bath reach the lake. They are flowing in this direction and the distance from the east end of the village to the lake is not over half a mile.

There is, therefore, danger of the pollution of Lake Salubria both from the village and from the houses on the terrace above it; and this danger would be increased by pumping from the lake and lowering its surface. It would create as it were a suction through the gravels in the direction of the lake. The second source of supply Mr. Gardiner did not have time to visit; but the testimony of a number of persons was taken respecting it. This is Spalding's creek which comes in to the Conhocton river on its north-eastern side, the same side on which stands the village of Bath. The creek enters the river about a mile and a half above the west end of the village. It does not rise upon the mountain plateaus, but has its source in large springs which burst out at the foot of the mountain. These springs are perennial and suffer little diminution in flow in the summer.

Looking across from the Soldiers' Home at the position of these springs Mr. Gardiner considers it probable that they have their source in waters which fall upon the surface of the high hilly plateaus and are stored up in the shales of the mountain, through which they slowly percolate downward to the level of the valley.

It is not known exactly how high these springs are above the village of Bath. They are probably not high enough to give sufficient head of water for the village without a storage reservoir, but without question the water comes from a source not likely to be contaminated. The highlands above on which the rains fall are sparsely inhabited, and the water before reaching the springs at the foot of the mountain finds its way through hundreds of feet of shales and sandstone. The amount of water given out by these springs was not measured; but Mr. Robert M. Lyon, the engineer of the village, states that they give ample water for the supply of any population that the village of Bath is likely to have for many years. If there is sufficient water from the springs of Spalding creek, it is in the judgment of the committee, a better source of supply for the village of Bath than Lake Salubria, because of the undoubted purity of the water and its security from pollution.

Sewerage.— The village of Bath cannot be made healthful without a system of sewerage and drainage. The sewers should carry nothing but the sewage proper, including excrements, fluid and solid, waste water soiled by washing, cooking or any other means, and such fluid waste from manufacturing as may safely be allowed to enter the pipes. The amount of sewage which the pipes will be required to carry is directly measured by the amount of water supplied to the village. All the water used in the village will be converted into sewage. When the sewers are built no privies or cess-pools of any description should be allowed. All filth of the village should be removed by water carriage through the sewers.

This is far the cheapest and most effective method of removing all harmful sewage matter from a town. In a few isolated cases the plan of having boxes in the privies and removing the solid excrement was observed to be in use in Bath. Even if all the solid excrement of the town were removed instead of passing into the ground, it would make very little difference in the amount of filth entering the soil. The total quantity of putrescible matter in the urine alone is nine times that in solid excrement of human beings. As a matter of fact the sewage matter of 3,000 people would differ but little in quantity, whether the solid excrement does or does not enter the sewers. There is practically no way of removing effectually all the sewage matter of Bath except by means of sewers. No storm-water should be admitted to the sewers.

With a porous sub-soil and such an elevation above the river as there is at Bath all the storm-water readily passes off through the soil. If sewers were built to carry storm water they must be very much larger and necessarily far more expensive than when made to carry sewage alone ; for the amount of rain-water falling upon a given area in a town may at times be twenty times as great as the amount of sewage proper to be discharged from that area.

Whenever roof-water from houses is admitted to the sewers to flush them two difficulties occur. In the first place in the season when it is most needed, flushing by rains is at very long and irregular intervals ; and then rain-falls may often come in such quantities as to choke the sewers and set back the sewage into the cellars.

The small sewers require daily flushing to keep them in sanitary condition ; and this is best accomplished by automatic-flushing tanks containing about 140 gallons, which are regulated to discharge once in every twenty-four hours, and are so placed as to flush all of the branch sewers thoroughly. These flush-tanks are fed from the water supply and, when full, discharge themselves automatically.

They fill the sewers with a solid piston of water, which passes through the pipes, carrying every thing before it.

In Davis avenue, New Brighton, which has the system of separate sewers, the discharge of the flush-tank makes a solid piston of water, which fills the pipes full at a distance of 600 feet from the tank. The collecting sewers, in the separate system, need not be over six inches in diameter. The theoretical objection urged against such sewers was that they would become clogged; but experience, for a number of years, in Memphis, Tenn., Norfolk, Va., Kalamazoo, Mich., and Keene, N. H., and other places, has shown that a very small number of stoppages occur, and that these are easily remedied.

In fact, no practical mechanical objection has been developed by the use of these sewers; while, on the other hand, they have proved to be far more wholesome than the large sewers. Where the separate system of small sewers has been used there are no complaints of disease from sewer air, which is so common a difficulty with the large combined sewers. The reason for the healthfulness of these sewers are two-fold. They are so small that there is no large accumulation of foul air in them to rise into the dwellings, and, owing to the small diameter and hard glazed sides of the pipes, they are easily kept clean by flushing. As regards expense, their cost is from one-half to one-quarter that of the combined sewers.

It is essential to the success of the "separate" system of sewerage, that care and skill be exercised in all the details of its construction; and experience is constantly developing improvements in the minutiae of such construction; the sewers of Keene, N. H., which were laid about a year ago, having points of advantage over the work in Memphis, which was the first important trial of the system in this country.

In the city of Keene, N. H., 61,200 feet of sewer, together with a complete system of sub-soil drains, was laid at a cost of \$74,000. There were several costly obstacles in the construction of sewers in Keene which would not be encountered in the case of Bath.

It is perhaps safe to estimate, roughly, that a system of sewers and sub-soil drains could be laid in Bath at an average cost of \$1.10 per foot, although it might reach \$1.20. Roughly speaking, there would be 30,000 feet of sewer required to provide for the whole village of Bath, and the cost of sewerage and drainage would be from \$33,000 to \$36,000. Mr. Gardiner's observations showed that there is ample fall for the sewers. Outfall for the system may be found into the Conhocton river, below the eastern end of the town. The sewage should not be discharged into the river opposite the village.

The river is a rapid, rippling stream below this point, and the water is not used for many miles below. Apparently no nuisance would be caused, at present, by such use of the river.

Should it ever become necessary to prevent pollution of the stream the sewage could be easily disposed of on a sewage farm at the south-east corner of the village. It is not necessary to discuss at present this method of disposal. At least for the time being the sewage may doubtless without harm be thrown into the Conhocton river below the village. Until a system of levels are taken through the village it is impossible to plan the details of the system of sewerage. The problem is a very simple one when such levels have been taken.

We have spoken constantly of sewerage and drainage because we deem it of great importance that drain tile for sub-soil drainage should be laid in the trenches with the sewers. The street sewers should have such a line of drain tile on each side of them so that branch lines of tile drain may be carried up to the houses on both sides of the street when the branch sewers are laid to the dwellings. This system of sub-soil drains is of the greatest importance in drying the soil and keeping sub-soil water down. The drains should not have an outlet into the sewers, but be given a separate outfall into the river.

Ventilation of sewers and house-drains. — The free admission of air at all points is absolutely necessary to the proper working of small sewers. When the flushing-tanks discharge and the water from them goes down the sewer in a solid piston, the air must readily escape in front of, and be as readily admitted behind, this body of water. It has also been found that nothing so promotes the wholsomeness of sewers and drains as a free and constant current of air. For these reasons, in the construction of the separate system, in Memphis, Col. Waring carried the branch sewers up to the houses without any trap, and there made connection with the soil-pipe, which was carried through to the roof full size and opened into the air.

The sewers thus ventilated either throw out their air or draw it in through the soil-pipes of the buildings of the city. This arrangement is not considered advisable by this board. In making their report to the board of health of the village of Peekskill this board recommended that traps be placed in the house sewers just outside the dwellings, and that pipes rise from both sides of this trap to and above the roof. The soil-pipe of the house should also be carried above the roof. The pipe outside of the trap opening into the

branch sewer allows the street sewer either to draw in the air or to throw it out as the case may be; while the pipe rising from the house side of the trap forms a foot-vent for the soil-pipe of the house, so that there is through the soil-pipe a complete circuit of air. If the soil-pipe is simply carried above to roof and no air admitted at the foot of the pipe there can be no current through a house-drain.

In order to secure a circuit through all house-drains it is necessary that air should be admitted to the drain at the point where it leaves the house. If this foot-vent, as it is called, only rises to the surface of the ground, any downward current through the house-drains throws out the foul air of the drains under the windows of the house. Down drafts do occur, and in summer they are sometimes continuous, the air entering the soil-pipe at the roof and passing down through the house-drain and out at the foot-vent; for this reason it is important that the foot-vent should be made so as either to draw in or throw out air without detriment to health.

Any attempt to ventilate sewers or drains by openings at the level of the street or in yards about the houses clearly imperils the health of the people. All ventilators either for house drains or for sewers should be carried above the roofs of the houses.

A diagram of the system of ventilation which this Board approves is appended to this report. It does not seem necessary to go into further detail concerning the plan for the sewerage of the village until it is decided that a sewer system shall be built.

If the village determine to proceed with this work, this Board will be glad to extend any assistance in its power in the way of examining and approving of the plans and supervising the methods and execution of the work.

General considerations.—In determining whether the improvements here recommended should be carried out, the citizens of Bath should remember that a pure water supply and a thorough system of sewerage and drainage in restoring the healthfulness of their village will greatly enhance the value of property. Under its present condition, Bath must be considered a dangerous place of residence.

Such a state of things must depress the value of property.

Neither life or health are any longer secure within your boundaries, and we earnestly recommend that immediate measures be taken for carrying out the necessary sanitary reforms.

Committee { JAMES T. GARDINER, *Chairman*,
 { EDWARD M. MOORE, *President*.
 { ERASTUS BROOKS.

REPORT OF DR. ALFRED L. CARROLL.

To the State Board of Health :

The village of Bath, Steuben county, containing a population of about 3,200, is situated upon the northern bank of the Conhocton river, its thickly inhabited portion being on a flat plain, ranging from twelve to thirty feet above the adjoining stream. The soil is nearly everywhere a coarse gravel, permitting free movement of ground atmosphere and water. The water supply is from surface wells, either dug or "driven," water being reached at a depth of from ten to sixteen feet in the lower part of the village; and the water level in these wells is observed to fluctuate in correspondence with that of the river and ponds in the vicinity. The disposal of excrement and house-wastes is by means of leaching privy-pits and cess-pools, which, in the majority of instances, are in perilous proximity to wells, and which, under any circumstances, in a soil where even liquids thrown upon the surface speedily sink from sight, would be almost sure to contaminate the common source of drinking supply. Into the river, about a mile and a-half above the village, is discharged a considerable amount of sewage from the Soldiers' Home, an institution with about six hundred inmates. On the south-eastern border, along the margin of the stream, lie many acres of marsh. On the western side are several ponds, the level of which has been subject to great variations at different seasons. There are, therefore, two sets of conditions which might possibly give rise respectively to malarial emanations or filth-poisoning.

As regards the nature of the present illness prevailing in the village, I find, after consultation with nearly all the local physicians, that there exists much diversity of opinion. All agree that endemic fevers have been increasingly rife, especially within the past year; but whilst some are inclined to class most of their cases as "bilious," "gastric," or "typho-malarial" fevers, with only occasional examples of marked typhoid, others report a great preponderance,

or even exclusive occurrence, of enteric fever. From careful inquiry and analysis of symptoms, I satisfied myself that, at the smallest computation, fifty-two cases of genuine enteric fever have arisen since May of last year, and I think that this estimate might probably be largely increased. According to the statements of several physicians, "fevers" of one kind or another have affected about ten per centum of the population, with a decided proclivity for young adults. I learn also that diarrhœal ailments of minor grade have for a long time been of frequent occurrence. On the other hand, I am informed that in the vicinity of ponds with much fluctuations of level, and particularly in the neighborhood of a railway construction through the marsh above mentioned, fevers of a noticeably paroxysmal type and dysentery have been observed. It seems probable, therefore, that, as in many similarly situated places, the cases of "fever" comprise some adynamic remittents of malarial origin, many instances of true typhoid, and an indeterminate intermediate range of malaria plus filth-poisoning vaguely classed as "typho-malarial."

As far as I can learn, isolated sporadic cases of enteric fever have been observed at intervals for a number of years past; but it was not until last May that the disease showed a marked tendency to spread. Even then its extension did not seem to proceed from any determinable foci, but cases arose almost simultaneously at different points. The practice of one physician appeared to point to a progression along a certain street in the direction of the usual flow of the ground-water; but from others I learned of preceding cases at the opposite end of the village. A number of instances happened in and about the principal hotel, but the domiciliary conditions of this establishment were better than ordinary, save as regards its situation in a closely-built neighborhood with a multiplicity of surrounding privies. No distinct history of importation of infection could be obtained; the milk supply was free from suspicion; and at the Soldiers' Home I was assured that no typhoid fever had existed since its foundation. A cottage about a quarter of a mile above the built-up part of the village, and having a privy close to the river bank, was occupied temporarily about eighteen months ago by a party of Italian railway laborers; but although there were among these some cases of diarrhœal disorder, the physician who attended them informed me that none were regarded by him as of specific character.

The distribution of the outbreak of fever indicates some widely

operative cause, and this, in my opinion, is to be found in a general pollution of the water supply. The coarseness of the gravel deprives it of any filtering power, and with the rise and fall of the river, there must be a lateral as well as an eastward movement of the ground-water. With the level of the latter so near the surface, it is evident that the contents of multitudes of privy-pits must sooner or later contaminate almost the entire basin; and howsoever the origination of enteric fever be explained, the discharges from each new case may add their specific infection to the common fund. As a possible adjuvant factor, it may be mentioned that most of the cellars are uncemented, the loose soil permitting the ground atmosphere to be indrawn to the warmer interiors of the houses.

Microscopic examinations of the deposit from an ounce of well-water showed minute masses of amorphous matter, probably faecal, two small particles of indigo; several vegetable fibres; micrococci and a few short bacilli.

On adding to this water a few drops of a sterilized fish-gelatin solution, these bacilli developed into longer rods, but their further evolution was obscured by the rapid invasion of bacterium termo.

A specimen of the well-water was forwarded for analysis to Prof. G. C. Caldwell, who was placed under the disadvantage — appreciable by all chemists — of not being informed of the local conditions. His report thereon shows:

Chlorine in chlorides.....	3	parts in 100,000
Nitrogen in nitrates and nitrites.....	0.99	parts in 100,000
Free ammonia.....	0.0005	parts in 100,000
Albuminoid	0.0015	parts in 100,000
Total oxygen absorbed (by Wauklyn's moist combustion process.....)	0.22	parts in 100,000
Hardness, equivalent to carbonate of lime before boiling	24	parts in 100,000
Hardness, equivalent to carbonate of lime after boiling	10.64	parts in 100,000
Total solids, dried at 220° F.....	37.6	parts in 100,000

In the light of the local investigation, it may be pertinent to remark that the *quality* rather than the *quantity* of pollution of drinking water is of chief sanitary importance. The presence of chlorides near the coast of salt water, or where saline deposits exist, is in itself of little significance; but where, as in the present in-

stance, its origin seems to be traceable to sewage contamination, even a minute quantity is of grave portent, especially where the excreta of specific enteric fever are known to have been discharged into leaching privy pits close to water supplies. The same reasoning applies to the estimates of nitrates and of total solids.

Respectfully submitted,

ALFRED L. CARROLL, M. D.

ALBANY, *April 7, 1884.*

REPORT OF ROBERT M. LYON ON LEVELS OF SURFACE AND SUB-SOIL
WATER IN BATH.

To JAMES T. GARDINER, Esq.:

DEAR SIR — Your letter was received by me last evening. This morning I took levels from the surface of the water in the river, south of Lackawanna street, to several public wells in different parts of the village. I am confident that one foot less in height in the river would be pronounced low water.

Respectfully,
(Signed) ROBERT M. LYON

Datum line. The surface of water in Conhocton river.

Elevation of Lackawanna rail	12.6
Elevation of Erie rail	8.0
Elevation of intersection of Lackawanna and Morris streets,	14.5
Elevation of ground surface at well near Ash street (Lane) ..	13.7
Depth of surface of water in well near Ash street (Lane) ..	13.0
Elevation of ground surface of water in well north of Pul-	
teney square.	13.1
Depth to surface of water in well north of Pulteney square,	13.0
Elevation at intersection of Liberty and William streets....	14.0
Elevation at well near Edwards' lot (near gas-house)	12.2
Water in well near Edwards' lot.....	10.5
Elevation at intersection of Washington and Howell streets,	15.9
Elevation at well near south-east corner of Robie lot	14.8
Water in well near corner of Robie lot	13.7
Elevation of sidewalk near north-east corner of Methodist	
Church	15.0
Elevation at well near McCall's lot.....	15.1
Water in well.....	15.0

REPORT ON PLAN OF SEWERAGE FOR THE VILLAGE OF MALONE.

To the Board of Trustees of the Village of Malone:

The State Board of Health on the 9th day of April received from your honorable body a request, that it should make an examination of the sanitary condition of your village with reference to its sewerage.

At the meeting of the State Board of Health, on the 23d day of April, this request was laid before the full Board, and was referred to the committee on drainage, sewerage and topography, with directions to make such investigation and report as should appear necessary.

Accordingly the chairman of this committee, Director James T. Gardiner, visited Malone on the 25th and 26th instants, and, under the guidance of Mr. N. H. Shields, the president of your village board, and other citizens, made an examination of the village with reference to its present sanitary condition, and to such measures as will be needed to insure the future healthfulness of the place. The facts ascertained by Mr. Gardiner and the conclusions of the Board thereon are herewith submitted in the following

REPORT.

Topography. — The village of Malone is approximately a mile long, from east to west, and some three-fourths of a mile broad, from north to south, and contains about five thousand inhabitants. The Salmon river, entering the village at the south-east corner, runs nearly westward, and then, bending abruptly toward the north, cuts the village into two parts near its center. The ground rises steeply from the stream in both directions. The river itself has a rapid fall, the power of which is utilized by several dams in the southern half of the village. The south-eastern corner of the village between Main street and Parmelee's mills is comparatively flat and only a few feet

above the river ; but from this point the river cuts deeper and deeper, while the surrounding ground rises until in the center of the village the stream is already from forty to sixty feet below the principal streets.

From Main street northward the river valley becomes deeper still, and has on the eastern side an abrupt bank probably sixty feet high. Above this bank lies Park and Elm streets on a sloping plateau which forms one of the most beautiful parts of the village. To the west of the Salmon river the village lies on high ground which slopes toward the east and north-east. With the exception of the low and flat region at the eastern end of Main street, and between that and Parmelee's mills, the eastern half of the village may be said to lie upon a high sloping plateau, the soil of which consists in greater part of sand and gravel, with an occasional small body of clay. The hills on which lies the western half of the village have more clay mixed with the sands and gravel ; but in general the whole soil of the village is quite porous.

The character of the slopes, the porosity of the soil, and the depth of the river valley running through the center of the village, secure unusual drainage, so that storm-water falling upon the surface of the village either runs quickly off or sinks into the deep drift material and drains away into the river.

Originally the surface of Malone was drained by a number of different lateral water-courses into the Salmon river. In grading the streets some of these have been interrupted so that in a few places there is difficulty in disposing of the storm-water, or the water from melting snow, when the ground is frozen.

Water supply. — For a number of years the village has had a sufficient supply of water brought from distant sources and supposed to be pure. There are some twelve miles of water-pipe now laid in the streets. Time did not allow an inspection of the sources of the water supply. But no doubts have been expressed as to its condition since 1872, when an epidemic of typhoid fever occurred. It was ascribed by some of the physicians to the water from a pond which had just been taken into the system of supply. So far as could be learned the village wells used are few.

Disposal of filth. — The filth of the village, including animal excreta, waste-water and all organic matter liable to decomposition, is now either thrown into cess-pools, or in many cases privies are used

and waste-water and refuse are thrown out upon the ground. On Main street, however, three short sewers have been built, one from the Ferguson House and the adjoining block, another from the block on the south side of Main street and east of the river, and the third on the west side of the river and the south side of Main street. There are also three large roughly-built storm-water drains, one running from near the corner of Fort Covington and Main street down toward the freight depot; the second running from Park street through Mr. Webster's grounds and emptying onto the hillside by the river; the third running down Willow street toward the river. Into two of these storm-water drains, filth is being thrown to the jeopardy of the public health. The sewer under the block on the south side of Main street and east of the river is objectionable, on the ground that it runs under the cellars of the stores.

This method of building sewers has been thoroughly tried both in New York and other places, and it has invariably led to difficulty in the end. These sewers cannot be kept properly flushed and cleaned, nor are they easily accessible for repairs. Eventually they become foul, or stoppages occur, and then the sewer-air or sewage leaks into the cellars, often causing disease on the part of the occupants of the premises before the evil is discovered. It has also been found in New York, that when zymotic diseases occur in one of the buildings connecting with sewers of this description, the infection is liable to pass through the sewer into all the houses on the block. If stoppage or partial stoppage occurs in a sewer that runs under a number of houses, the occupants higher up the block are affected in health before they know of the existence of the difficulty which they are without any means of remedying, since it is on the premises of other parties. Such sewers are liable to become broken and deranged by excavations in cellars, by settlement of walls, and by various other causes which in practice have proved so serious, that they are now entirely abandoned in places where sanitary care is exercised. Only street sewers should be allowed.

Sewers running under blocks of buildings are generally too large to be thoroughly flushed. If made small they are soon stopped up by the misuse of some of the occupants of the block who carelessly throw large articles into them. No proper supervision can be exercised over sewers constructed in this way. If the sewer is laid in the street, and only four-inch pipes are allowed to pass from the house to the street sewer, then carelessness on the part of the occupants of

the premises simply results in blocking their own house-connection, and not in blocking the whole sewer.

The sewer under the Main street block is, we believe, a ten-inch pipe. The water going into it is entirely insufficient to insure its thorough daily flushing. The short sewer under the block on the west side of the river is open to the same objection.

The porous character of the soil of Malone, the depth of the sand and gravel, and the complete under drainage into the deep valley of the river, have as yet prevented any serious effects being felt from the use of cess-pools and privies, serious in the sense that the effects have not been so marked as to attract general attention, and cause widespread alarm; but the soil about the dwellings is becoming more and more polluted, so that the danger from filth-poisoning is steadily increasing. The filth from privies and cess-pools is now contaminating the ground-air about the dwellings.

The soil of Malone contains air to the amount of from thirty to forty per cent of its own volume. This air circulates freely through the particles of sand and gravel, passes into the cellars and rises through the dwellings, especially when the surface of the ground is frozen and the dwellings are heated. The warm ascending currents then make the houses so many chimneys sucking out the ground-air. This air is contaminated with all the decaying organic matter which is in the soil, and it may also become a carrier of the poison of specific disease. Should an epidemic break out in Malone the danger from the contamination of the soil would be greatly increased. Besides the danger from the contamination of the ground-air, it is not unusual in the wet season, when the ground is full of water, for the dissolved filth to percolate into the cellars. Many householders whose premises are on slopes are endangered by the cess-pools of their neighbors on the higher ground, from the percolation of the dissolved filth through the soil.

In a soil as loose as that of Malone, currents of foul water may run for quite a long distance with comparatively little filtering action taking place. Experiments of the National Board of Health under Professor Pumpelly show, that coarse sand and gravel has very little power to filter out any bacterial infections. Experiments were made by Professor Pumpelly on the filtering power of different soils. He says: "We find in the sand an absolute absence of filtering power as regards germs in water, which would probably be as evident in columns of ten thousand feet as one hundred feet. In the loess, and in the much more frequent compact kaolin on the other

hand, there is evidence of a greater filtering power ;” and in summing up the results of his experiments on the filtering power of soils he says: “From these results it appears very clearly that sand interposes absolutely no barrier between wells and the bacterial infection of cess-pools, cemeteries, etc., lying even at great distances in the lower wet stratum of sand. And it appears probable that a dry gravel or possibly a dry very coarse sand interposes no barrier to the free entrance into houses built upon them, of these organisms which swarm in the ground-air around leeching cess-pools, leaky drains, etc., in the filthy made-ground of cities.” Experience in many places has confirmed the truth of the conclusions reached by Professor Pumpelly in these experiments. We can, therefore, confidently report, that the use of cess-pools in the village of Malone is probably more or less affecting the health of the people ; that the danger is an accumulating and increasing one ; and that, in case of the breaking out of an epidemic, this contamination of the soil about the dwellings may become a potent factor in the spread of disease.

Reference has already been made to two cases in which drains built originally for carrying off storm water from the surface are now used for depositing filth. We say depositing, because the filth is not carried away by these drains owing to their construction. These storm-water drains are generally at least two feet wide, are roughly paved on the bottom with cobble stones, have rough dry walls at the sides, and are covered with flat slabs of stone. Small quantities of water passing in from house drains do not flow down these storm-water drains, but simply sink into the sand between the cobble stones, leaving a deposit of filth on the bottom of the drain. When at last a storm comes this accumulated filth is washed down and thrown out at the mouth of the storm-water drains. A village ordinance should be immediately passed forbidding the use of storm-water drains for the disposal of sewage.

In the case of the drain leading from the corner of Main and Fort Covington street, down toward the freight depot, any filth deposited in this drain will remain piled up until the coming of a heavy rain, when it will be washed down and deposited in the yards of the houses where the mouth of this drain opens.

In the case of the drain running from Park street, through Mr. Webster’s grounds, the conditions are as follows : A rough storm-water drain runs close by the side of Mr. Webster’s house and very near the surface of the ground. There appears to be no current through it except in times when large bodies of storm water fall

upon the surface. Several families have small glazed-pipe house drains leading into the large storm-water drain. The house drains bring down sewage and throw it into the storm-water drain, close to Mr. Webster's house; there it doubtless remains until the coming of a storm. It is well known that there has been constant sickness in Mr. Webster's house. It is not ascribed to the drain; but if the family have thus far escaped the influence of the improper conditions they are certainly fortunate. The storm-water drain alluded to does not discharge into the river but onto a hillside that slopes down to the stream. The whole arrangement is unsafe. Unless the inhabitants of Park and Elm streets take immediate steps for the construction of a regular and proper system of sewers, the pipe sewer extending from Dr. Belden's house down to Mr. Webster's should be continued to the river itself and emptied there. But this is an expensive arrangement for the people, and not so healthful as to connect their houses with a properly flushed street sewer.

A number of citizens, we learn, are intending to build their own private sewers down from Park street to the river. We earnestly advise that this should not be done; but that they should join in carrying out a common plan for a sewer along Park street. It will cost less, and will be in every way preferable for sanitary reasons.

To prevent the dangers of pollution of the soil now going on in Malone, and to obviate the necessity of the costly and defective expedient of private sewers and drains, we recommend the adoption of a general plan of sewerage for the whole village.

Plan of sewerage.—The village is so situated, and the soil is of such a character that no inconvenience is experienced from storm water, or from the water of melting snows, excepting during a few days in the spring when the ground is frozen. At these times there are accumulations of water at a few points. They have been, however, in large part already relieved by the building of storm-water drains before mentioned. On the flat at the north-east corner of the village there is opportunity of still further relief by carrying the water from Cemetery hill down William street, and thence south-westward into the river below Parmelee's mills. The steep slopes, the porosity of the soil, the short distance to the river and its rapid fall give such facilities for surface-drainage of storm water that it is entirely unnecessary to admit any storm water into the sewers. We recommend for Malone what is known as the "separate system;" that is, the sewers should carry sewage only and no storm water

from the roofs or the streets. When sewers are built to carry sewage only they can be made much smaller than when rain water is to be admitted. The smaller a sewer is the less it costs, and the more thoroughly it can be flushed. The sewage from a given district is very small in amount compared with the rain water likely to fall upon it. It is easy to determine approximately the amount of sewage which will flow from a given number of dwellings; but the amount of storm water is a very uncertain quantity. The flushing of the sewers in the "separate system" is best accomplished by automatic flush tanks holding about one hundred and forty or one hundred and fifty gallons, and discharging about once a day. Small pipes may be kept thoroughly cleaned by daily flushing with a comparatively small quantity of water.

The theoretical objection urged against small pipes was the danger of stoppage. They have now been in use in this country so many years that the knowledge of their working is no longer a matter of theory, but of practical experience. If properly built, and regulations concerning the house connections are properly enforced, the small sewers are found to be so seldom obstructed and so easily freed from stoppage, that the small size offers no mechanical objection to their operation, while from the sanitary side they are found to be a very great improvement over the larger sewers. They do not become foul, they are not store-houses for sewer air, and they have not proved themselves to be breeding places of disease, as have the larger structures. They can be thoroughly ventilated and constantly flushed.

In Memphis where they were first tried more difficulties have been encountered from stoppage than in Keene, New Hampshire, where many improvements have been introduced in the construction of the separate system. Because of the very moderate cost, and because of the sanitary advantages of the separate system of small sewers with automatic flush tanks, we advise their use in the village of Malone.

The chairman of the committee examined the ground, and has made a detailed plan for the sewerage of the village, which has the advantage that it can be carried out piece by piece as the different sections of the village may desire its execution, and are able to pay for it.

Detailed plan.—There being no map showing the elevations along the streets of the village, Mr. Gardiner made a reconnaissance

with a small level. Along most of the streets the grades are so steep that no leveling was necessary to show that there is ample fall for sewers. In a few cases, however, leveling was required to determine the practicability and direction of slope for sewers. The proposed plan of the sewers is shown on the accompanying map. The grades are not given; but in every doubtful case they were determined to be practicable and to give ample fall to the pipes.

The topography of the village divides it into seven natural drainage districts, each of which requires a separate outfall into the river. The seven districts are therefore independent one of another, and the sewerage of any one of them may be carried out without reference to the others, and in most of the districts a part of the plan can be executed without completing the whole.

There are many streets where it is doubtful whether the inhabitants are yet ready to construct sewers, while in other regions the great majority of the people demand this sanitary improvement. In making the plan these facts were considered, and it is believed that such portion of the population as are now prepared to carry out sewerage can do so under this plan without hindrance from those who have different views.

For instance, the great body of the people living on Park and Elm streets, and along the central part of Main street seem already awake to the necessity of thorough sewerage. In the plan given, the people on Park street, First street, Second street and Constable street can by mutual agreement proceed to construct a system of sewers having an outfall into the river on approximately the line of Second street continued. The inhabitants of Elm street, from Senator Gilbert's to the Ferguson House, together with those of Morton street, can proceed at once to build their sewer, having an outfall under the Main street bridge.

Into this will eventually come the two sewers which should be built, one on either side of Main street, from the Congregational church to the junction of Elm street. It would be well to have an eight-inch sewer from the junction of Main and Elm street to the bridge; but for all the other sewers in the village six-inch pipe will be ample, provided they are properly laid and the joints properly made.

As some doubts were expressed by citizens as to the sufficiency or six-inch pipe, we may state that in Memphis one of the lateral sewers is over two thousand feet long and carries off the sewage of six hundred people.

At the ends of the lateral sewers there should be automatic flush tanks holding from one hundred and forty to one hundred and fifty gallons. Water would be supplied to these from the village water-works, and they could be arranged to discharge with greater or less frequency, depending upon the work to be accomplished.

As a general average, they should discharge once a day. The water from these flush tanks goes in a body down the sewer, making a solid piston that fills the pipe and completely scours it.

As to the grades of these sewers the average grade of the six-inch pipes in Memphis is about nine inches to the one hundred feet; but they work well in Keene, which is a much flatter place, with grades as low as three to six inches to the one hundred feet. In Keene the sewers are laid at least six feet below the surface; and this depth will doubtless be required at Malone to secure them from the action of frost, and to give a proper fall to the house drains.

There should be lamp-holes every three hundred feet along the sewers through which to observe their action, and to facilitate the proper cleaning out of any obstruction. The lamp-holes are made by bringing a six-inch pipe from the sewer up to within two feet of the surface of the ground. A lid fits on the end of the pipe, which is then covered with earth. In case it is desired to examine the working of the sewer at any point, it is easy to dig down and uncover these pipes, and by lowering a lamp to observe the working of the sewers, or in case of obstruction, the tools for cleaning the sewers are sometimes introduced through the lamp-holes.

Where stoppages occur that cannot be removed in this way, it is necessary to dig down to the sewer itself. For the purpose of removing any obstinate stoppages, joints of pipe, whose tops are open and fitted with covers, are laid every one hundred feet along the sewer. The use of these joints of pipe, with movable top, prevents the necessity for breaking open the sewers. A few man-holes will be needed at properly selected points in each sewer district. These should be fitted with covers which can be securely locked to prevent any thing being thrown into the sewers. The sewers run through the bottom of these man-holes with unbroken grade and section so as not to interrupt the even flow of the stream.

The man-holes are, however, somewhat expensive, and as few as possible should be used. The lamp-holes should be placed at every change of direction or grade.

As regards out-fall, the six-inch pipe must be carried out far enough into the stream to insure its mouth being covered with

water throughout the season. To accomplish this it will be necessary to build small masonry piers about the mouth of the sewers, so shaped on the up-stream side as to prevent their being carried away by the ice.

The sewer from the Ferguson house, which now opens under the bridge, has its mouth high above the stream of the river, and the sewage is thrown out upon the rock ledge which forms the bank. The Main street sewer should be continued down the rocks until its mouth is under water.

In constructing this system of sewers it will be necessary to have the supervision of some engineer of experience in this class of work. The flush tanks also should be built by somebody who is practically acquainted with their construction and working. The sewers must be laid straight between points of changes of grade. The grades of each portion must be carefully determined by the engineer in charge of the work, and great care must be used to secure good material both for the pipe and the cemented joints. Especial vigilance is necessary in cementing the joints to avoid pressing the cement through into the interior of the pipe. It is all important that the interior of the sewer should be smooth so as to present no roughness of joints where filth and obstructions may lodge.

In one village where these sewers were laid this precaution was neglected and it cost between \$1,000 and \$2,000 to clean the pipes so that they would work well.

Joints for house connections should be put in opposite every house at the same time that the sewer is being laid. No house drain over four inches in diameter must be allowed. At least one line of ordinary drain tile should be laid in the trench with the sewer. This should be carried up to every house in the trench with the house drain to secure thorough under drainage of the soil about the houses.

The success of the working of these sewers will depend very greatly upon the skill with which the work is executed. If they are carefully and properly laid, and the joints made of good cement without roughness in the interior of the pipe, and if the flush tanks are properly constructed, having reference to the severe climate of Malone, these small sewers can be relied upon to carry off the sewage of Malone in a most efficient and healthful way.

With the exception of the extreme southern district the outfalls are into the rapid current of the river, the valley of which is so deep that no nuisance seems likely to be created by its use as an outfall for the sewage.

Respecting the cost of these sewers, it is a difficult matter to give an exact estimate, until final surveys are made. In the city of Keene, New Hampshire, where the sewer system comprises sixty-one thousand two hundred feet of sewer and sub-soil drains, the total cost was \$74,000, including fifty-four flush tanks and the long fifteen-inch outfall sewers. There were, however, at Keene serious difficulties in excavating the streets, owing to the quicksand and large amounts of water in the soil. In other places it has been necessary to excavate rock, and in most places where the separate system is in use, the main trunk sewers have had to be much larger than would be required for Malone.

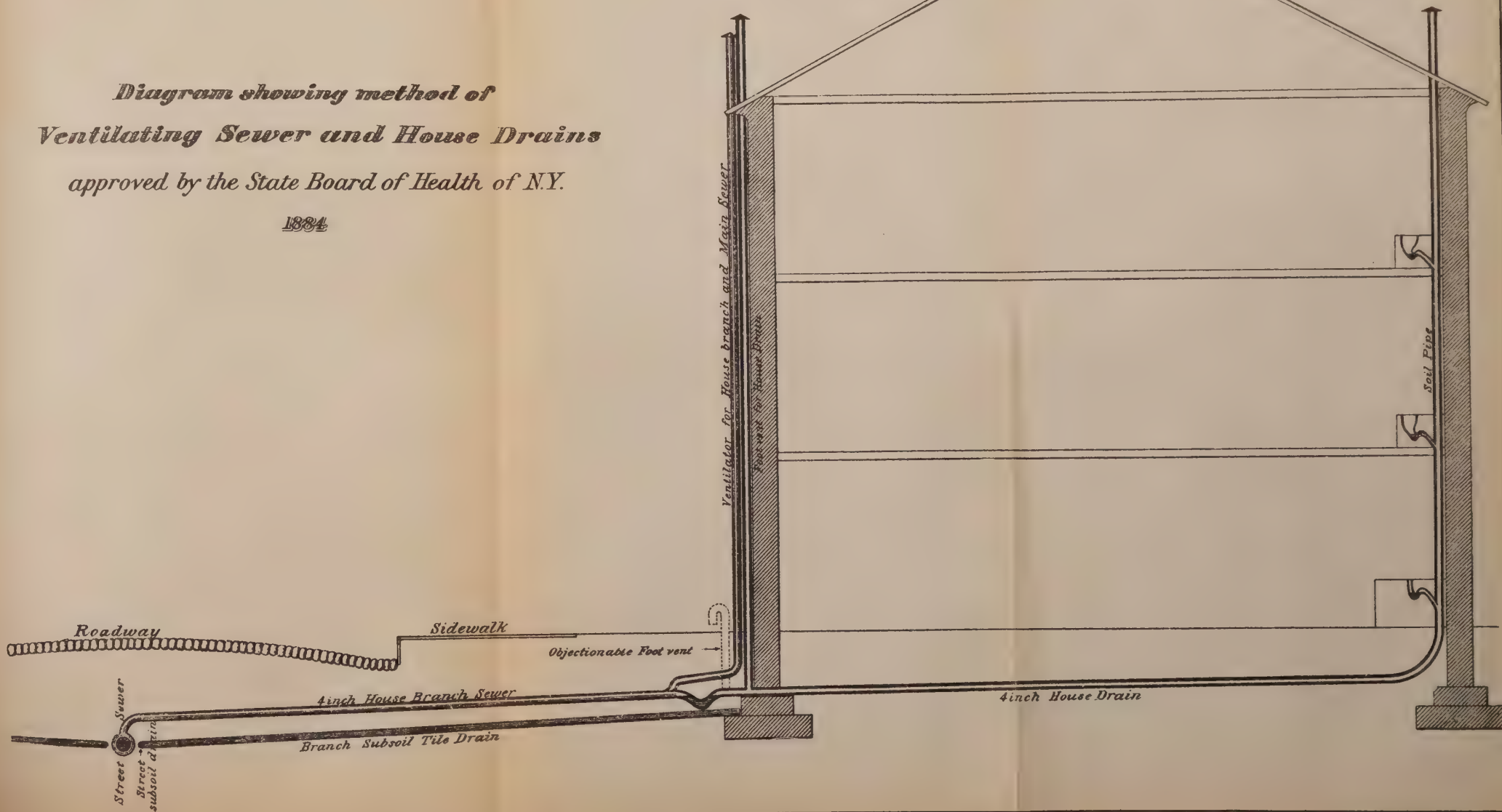
The excavation in Malone will probably be entirely in loose earth with very easy digging. The excavation of the trenches for the sewer in the case of Malone can probably be made at the very minimum cost. This fact together with the condition that only six-inch pipe will be required even for the outfalls, except possibly for a short distance on Main street, render it highly probable that the cost of the plan proposed will not exceed ninety cents to \$1 per running foot, including the construction of man-holes, lamp-holes, automatic flush tanks and the royalty to be paid on this patented article. All the automatic flush tanks that are working successfully in this State are patented.

The Elm and Morton street sewer district in Malone, requiring, as it will, only two flush tanks, and some three thousand six hundred feet of pipe, can probably be built at a cost not exceeding \$3,000 to \$3,600. The system for Constable, First, Second and Park street district would probably cost a little more. These must be taken as mere approximate estimates based on a reconnaissance of the general conditions of the districts. The exact cost can only be determined by getting bids from contractors, based on working specifications.

House Connections, and Sewer and House Drain Ventilation.—Four-inch house branch sewers should lead from the street sewers up to the houses. In general, a fall of a foot will be sufficient between the house and the street sewer. No house connection exceeding four inches in diameter should, under any circumstances, be allowed. The house branch sewers should, for most of the houses, not enter the front of the building, but be carried through the yard along the side of the house. Almost all of the houses are on such large lots that there is plenty of open ground between them. Water-closets and sinks are generally situated near the back of the house. Under

*Diagram showing method of
Ventilating Sewer and House Drains
approved by the State Board of Health of N.Y.*

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such circumstances the best arrangement is to lay the house branch sewer along the side of the house at some distance from the foundation, until a point is reached opposite the vertical soil pipe of the house, and then connect the two by the shortest practicable line of drain. This prevents long lines of drain being laid under the house. Such an arrangement as we have described is of course not practicable, where dwellings stand close together in cities; but it is well adapted to the conditions at Malone and to those in many other villages.

Outside of the house there should be a trap in the drain to serve two purposes. It will prevent the passage of air from the street sewer or the house branch into the dwellings. If this trap is constructed properly it will also serve to arrest any large article which has been thrown into a house drain, and might by further passage cause obstruction in the house branch or street sewer.

In Memphis, for reasons which will be shortly explained, traps were not put in outside of the houses, and the result has been that obstructions have occurred by the passage into the sewer of large articles which would have been arrested immediately outside the house had there been properly-shaped traps. The traps were omitted in Memphis for the reason, that it is of utmost importance that the street sewer should have free access to the open air through the house branches. When the flush tanks discharge, in order that the flushing effect may be obtained for the greatest possible distance, it is necessary that the air in front of the water should find ready escape at every point, and also that air should be as freely admitted behind the flushing piston of water in order to drive it rapidly forward. For this purpose it is necessary to have frequent openings into the air, which can only be secured through the house connections. In Memphis, therefore, the house branch and house drain is carried without a trap through the house and above the roof, and opened into the open air the full size of the four-inch pipe.

We object to this arrangement, because house branch sewers are likely to be more foul than small street sewers. A large part of the grease in the waste water is likely to remain in the house branch within a few feet of the dwelling. Often there is not sufficient water from dwellings to scour the house branch. A lining of filth is, therefore, not unlikely to accumulate in the house branch within the first thirty or forty feet from the dwelling. This filth may easily become the breeding ground of disease. In case the air of the house branch is allowed to pass back into the dwelling, there will escape into the house contaminated air in case of leakage in the

house fixtures; and it must be clearly understood that it is not practicable to prevent the occurrence of leakages in plumbing.

The thorough ventilation of the house branch and street sewer can be accomplished without allowing sewer air to pass through the vertical soil pipe of the house. If a trap is placed just outside of the house, and two four-inch pipes rise from either side of this trap to above the roof of the dwelling, and at the same time the soil pipe is also carried up above the roof, the street sewer is given perfectly free ventilation both to secure the working of the flushing tanks and to keep the sewer air constantly changed, and the house drain also is thoroughly ventilated. When the water from the flushing tank comes down the street sewer, the air will be driven before it out of every house connection and carried above the roof. As the flushing water passes down the street sewer beyond any house connection, the air will be drawn back again through the house branch from the ventilating pipe outside of the house, so that currents of fresh air will circulate freely in street and branch sewers without in any way endangering the inhabitants of the dwelling.

The pipe rising from the house side of the trap through the roof forms what is called the foot-vent of the house drain. Taken with the soil-pipe, which also should be carried above the roof, it forms a U through which the air may circulate in both directions through the house drain. One arm of the U is outside of the house and the other is inside. The difference of temperature of these two arms will generally produce a free movement of air. In certain towns the foot-vents have been made short, merely rising to the surface of the ground instead of going to the roofs of the dwellings. By such an arrangement the drain air is thrown out of the foot-vent under the windows whenever there is a down draft through the drain. A number of cases have occurred in Albany, which have come to the knowledge of the committee, where the smell from these short foot-vents was so strong in summer as to cause serious nuisance. In winter when the houses are heated there is not the same tendency to a down draft in the house drain; but in summer at the time when it is liable to cause the most harm, the house being often colder than the outer air, down drafts are of frequent occurrence in some houses.

A trap outside of the house situated between two ventilating pipes is not likely to be syphoned, an equality of pressure being easily maintained on both sides of it. If the traps outside of houses are properly shaped they will prevent many obstructions from passing down in the house branches and street sewers.



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State Board of Health
PLAN FOR THE SEWERAGE
of the
VILLAGE OF MALONE,
FRANKLIN CO. N.Y.
Scale 390 feet to one inch.

A diagram showing this method of ventilation is given with this report. The diagram shows the trap as situated in front of the house; but in the case of Malone, where the house branch sewer may be laid in the yard along the side of the house, the trap and ventilating pipes would be on the back of the house, and on the side, instead of in front of it, as shown in the diagram. But the principle will be understood from an examination of the drawing.

The carrying of the house branch sewer along the side of the dwelling will, if drain tiles are laid in the same trench with the sewer, secure such thorough under draining of the ground that there will be no trouble from wet cellars. This is a very important sanitary consideration.

The minimum depth at which street sewers are laid should have reference not only to climate but also to securing thorough under-drainage of the cellars of the dwellings. A rigid ordinance should be enforced against the admission of any storm water into the sewers themselves. When there is a thorough system of under-drainage accompanying the pipe-sewers the roof water of houses if carried out on the ground will percolate through the soil and be carried away by the sub-soil drains, in such a soil as that of Malone.

Conclusions.—In conclusion the committee would repeat their opinion that the construction of sewers and sub-soil drains as herein described would be of decided sanitary advantage in Malone, and would go far toward insuring for the village that healthfulness which the citizens have reason to expect in a locality with such great natural advantages. The present means of disposing of the village filth is, as we have shown, already improper and is liable to become more and more a source of danger to the public health.

*Committee on Drainage,
Sewerage and Topography*

{ JAMES T. GARDINER,
Chairman.
E. M. MOORE,
President.
ERASTUS BROOKS.

[Sen. Doc. No. 47.]



REPORT ON THE SEWERAGE OF THE CITY OF KINGSTON.

To His Honor the Mayor, and the Sewerage Committee of the Common Council of the City of Kingston:

GENTLEMEN — At the annual meeting of the State Board of Health, in Albany, May 14, 1884, Dr. Geo. W. Cooke, commissioner of the State Board of Health, presented a letter from Mr. A. Grant Childs, city engineer of Kingston, stating that Your Honor and the committee requested, that Director James T. Gardiner, chairman of the committee on drainage, sewerage and topography of the State Board of Health, should visit Kingston at an early date and make an examination of the city with reference to its sanitary necessity for a system of sewerage and drainage, and to advise as to the best method of carrying out such work.

The city engineer stated, that he had already made some preliminary plans, and was personally anxious to secure the advice of the board with reference to them as soon as possible.

Commissioners of the State Board of Health — The State Board of Health voted to accede to the request of the city of Kingston and desired the chairman of the committee to make the sanitary investigation as soon as practicable. It also empowered the committee to report the results to the common council of the city of Kingston. On the 15th instant Director Gardiner proceeded to the city of Kingston and was met by the city engineer and Dr. Geo. W. Cooke. The city engineer laid before Mr. Gardiner a map of the place and gave him all needed information respecting grades, etc., and then, on the 16th, conducted him over the whole area of the city, Dr. Cooke accompanying them in the sanitary inspection of its northern part. On the afternoon of the 15th Mr.

Gardiner and Dr. Cooke met your committee, and Mr. Gardiner briefly stated his general conclusions respecting the sewerage question. On the evening of that day he addressed the common council on the sanitary condition of the city and the necessity and best means of sewerage. His observations and the conclusions of the committee of the State Board of Health are respectfully transmitted to you in the following

REPORT.

Topography — The city of Kingston extends from the Hudson river and Rondout creek, on the east and south, across a hilly and plateau region to Esopus creek, whose valley bounds it on the north. The average breadth, measured from south-east to north-west, is about two and a half miles. The length of the city is about the same. Large tracts, however, which are not occupied with buildings will not require sewerage for many years. From Rondout creek and the Hudson steep rocky slopes rise for more than half a mile, when a table land is reached at an elevation of about one hundred and eighty feet above the Hudson. The 5th, 6th, and 7th wards of the city, formerly comprised in the village of Rondout, lie on the steep slopes descending from the plateau to Rondout creek; but the greater part of the city is on the table land which stretches between the top of the hill and the valley of Esopus creek. This plateau is the old river terrace of the Hudson, and is almost exactly level. Its elevation varies from one hundred and seventy-nine to one hundred and eighty feet above the river.

The flat valley of Esopus creek has been eroded out of this alluvial deposit. The northern front of Kingston, along which run North Front street, Clinton avenue and Albany avenue, is marked by the bluff which outlines the valley of Esopus creek. This bluff is about thirty-five feet high. The bottom lands around Esopus creek are one hundred and forty to one hundred and fifty feet above the Hudson.

From the bluff to Esopus creek at North Front street, is about one thousand two hundred feet; but the flat lands rapidly widen so that at Albany avenue the flat between the city and Esopus creek is half a mile wide.

Esopus creek runs to the north with a gentle current for the first part of its course, and then falls rapidly down to the Hudson which it enters at Saugerties some twelve miles above Kingston, the total fall of Esopus creek between Kingston and the Hudson being in the neighborhood of one hundred and thirty-five feet.

Topographically, therefore, Kingston is divided into three distinctly marked regions: the sandy plateau on which the greater part of the city lies; the low alluvial valley bordering Esopus creek; and the steep, rocky hillside district bordering Rondout creek and the Hudson. The plateau has a porous sandy soil some twenty-five feet in depth. At this point a bed of clay is encountered above which is a water stratum which seems to carry a large part of the water that falls upon the surface of the city.

The impervious clay stratum which underlies the water was found to outcrop along the bank bordering the northern edge of the city, and to occasion there a long line of moist springy ground which is liable to cause malarial disease among the people who live along the closely built northern edge of the city. The alluvial lands about Esopus creek are subject to overflow in the spring and are not built upon, but are used for agricultural purposes. The bed of the creek is so far below them that they are thoroughly underdrained after the subsidence of the floods. A large part of this valley land must be at least ten feet above the average water of the creek. The surface of the city was naturally drained by three brooks and their branches, and by the rapid soakage of surface water through the porous soil to the stratum of clay twenty-five feet below. The small brooks, which formerly drained the surface of the city, still do an important work in this respect. One of them is the Tannery brook, lying between Washington avenue and Green street, another is the brook running down through Wilbur to Rondout creek, and the third is the brook following approximately the line of Hasbrouck avenue, and emptying into Rondout creek near the ferry slip. The courses of these brooks are still kept open and they are playing and must always play an important part in the surface drainage of the city.

Drainage—Mr. Gardiner visited Kingston immediately after a heavy rain, but found the surface of the city was free from any accumulations of storm water, and no troubles from this source were reported. The drainage of the city, as regards storm water, may therefore be considered quite complete, although in small exceptional localities some work may be needed in the future. This drainage is accomplished in three ways: through short storm-water drains; through the porous soil, and through the open channels of the brooks before mentioned, two of which head in the southern edge of the plateau of Kingston and the third borders it on the west.

Into these brooks there enters a number of short storm-water sewers, built for carrying storm water only, which have been well placed, and

are so well adapted for their purpose, that they relieve the flat parts of the city from any accumulations from rainfall. In addition to this a large amount of water percolates through the sandy soil, and finds outlet all around the city, below the edge of the plateau, giving quite a complete underdrainage of the soil of the town, so that wet cellars are rarely known in Kingston except in certain small areas.

To thoroughly complete the system of drainage, it will be necessary to underdrain the springy land which lies along the northern front of the city immediately adjacent to the wealthiest and most populous part of the city. Along North Front street and Bridge street I found houses thickly grouped immediately overlooking the saturated lands. Dr. Geo. W. Cooke, Commissioner of the State Board of Health, pointed out house after house where the people were suffering from pronounced malarial fever. There are doubtless other tracts about the north-west part of the city where sub-soil drainage would greatly improve the health of the people. Wherever springy or saturated ground occurs it should be thoroughly underdrained so as to be kept permanently dry, when it is in the vicinity of habitations. Outfall for these drains is easily found into neighboring water-courses.

The underdrainage of the land along the north front of the city would not only greatly improve the health of the people living immediately above on the plateau, but greatly enhance the value of some of the flat lands of Esopus creek for agricultural purposes. The benefits will, therefore, be both to the property owners for agricultural reasons, and to the community at large for sanitary reasons.

The worst place observed on the north front of the city was in the flat adjoining Tannery brook, between North Front street, and the railroad, and bounded on the west by Bridge street. The miasmatic influence of the saturated low lands in this locality may easily be carried by north-west winds over the whole north-western part of the city, so that those immediately about the saturated lands are not by any means the only sufferers. Malarial fever is quite common in parts of Kingston. It was not possible to ascertain exactly its distribution through the town; but the physicians report a large amount of it in the north-western portion of the city. There can be little doubt that thorough drainage will go far toward lessening the prevalence of this disease.

The existing storm-water sewers or drains, as they should properly be called, are reported to have cost about \$30,000.

Sewerage — There are reported to be about twenty thousand people in Kingston. All the filth incident to this large population is now being accumulated in the soil of the city, excepting a small part of it which passes into the brooks and is either carried down into Rondout and Esopus creek or lodged along the channels of the brooks rendering them most unwholesome and injurious to the public health.

The storm-water drains which have been built discharge into the natural water channels. Until recently the people of Kingston have used well water. Now there is a liberal water supply for the whole city, and since its introduction water-closets are of course becoming more or less common, and outlet for the waste water is in many cases being found by making connection with the storm-water sewers. In the great majority of cases, however, the filth of the city, consisting of slops and waste water, that has been soiled by domestic or manufacturing uses, as well as solid and liquid excreta, is passing into cess-pools, from which it leaches rapidly into the porous soil. The soil is so porous that these cess-pools can be used for a number of years, till at last they become lined with a coating which prevents the passage of water into the ground. When this occurs it has been usual to dig another cess-pool, and thoroughly saturate another spot in the ground adjacent to the dwelling, and this process has gone on for years. In a few cases the old cess-pools are used and pumped out when they overflow, but, so far as could be learned from a rapid examination, the greater part of the filth of the village is accumulated within its precincts. All the water that is brought by the water-works into the city is being converted into sewage; and there is no means yet provided for transporting this sewage out of the city.

A small amount of it, as we have said, passes down the brooks with the surface water, and some of it is being discharged along the northern front of the city into the springy ground before mentioned. The Tannery brook which runs down between Washington avenue and Green street was carefully examined. The upper part of its course, where it receives simply surface water, is clean and in a healthful condition; but below the crossing of Pearl street, where it receives house drainage, the channel is lined with filth, and with decaying animal and vegetable matter. Just north of Front street, in a thickly populated locality, the stream is dammed; and a large amount of the filth is deposited on the banks, which are alternately exposed to the sun and overflowed with water. Here the brook channel has been diverted from the lowest part of the valley, which

lies a little to the east of it; and this lowest part of the valley immediately behind a row of stores is saturated with filth.

Nearly north of Front street, where the brook runs down into the flat in the low springy ground there is a pond, which in the spring fills up with the filthy water washed from the slopes above, and slowly dries out in the summer. This pond is already thick with vegetable matter, and doubtless contains enough of decaying animal matter to give the necessary conditions for development of filth diseases.

Conditions now exist along this Tannery brook from Pearl street down to the railroad crossing which are just such as would promote malarial and the so-called typho-malarial fevers. But the condition of this brook is sweet and wholesome, compared with the brook which runs down near the line of Hasbrouck avenue through the fifth ward. The spurs of the hill rise steeply on both sides of this valley. It is densely crowded with population, and the whole brook is lined with privies. Even on the cool day when the brook was inspected after thorough flushing with hard rains the stench from this brook was most offensive. Hundreds of people live along its course and the doctors report that diphtheria, malarial and typho-malarial fevers prevail to an alarming extent.

On the sandy plateau, which is the most populous and wealthy part of the city of Kingston, the filth is mostly disposed of in cess-pools; which simply means that it is being absorbed by the ground. The effect of throwing such a large amount of sewage into a sandy soil is to coat the particles of sand with filth. Between the grains of sand there is a quantity of air which moves more or less freely through the soil. A cubic yard of the Kingston soil contains about 30 per cent of its own volume in air. This is called the ground-air. When the soil is filled with filth the ground-air becomes contaminated like the air in a drain. A certain amount of filth is doubtless dissolved by the percolating water, and carried downward through the sandy soil until it reaches the clay; along this it flows to the nearest point of discharge, which, in the case of the northern part of Kingston, is along the bank at the north edge of the city. The water, therefore, which forms the springy ground close under North Front street and Albany avenue, is contaminated water bringing with it dissolved sewage.

The effect of saturating the soil about dwellings with filth is to contaminate the ground-air, which passes into dwellings through the cellars. In winter when the houses are heated, very powerful up-

ward currents are created which suck the ground-air into the cellars. This cellar-air rises through the houses, and, if it is contaminated with filth or miasmatic poisons, it is liable in all cases to lower the strength and vital power of the inhabitants. In many cases it produces specific diseases. The system of leaching cess-pools, meaning, as it does, the saturation of the soil with filth, is universally condemned by sanitarians throughout the world. The results on human health are clearly known by experience.

The city of Kingston need not expect to be any exception to the general rule, that the poisoning of ground-air about dwellings means eventually the poisoning of the people. Not only does the contaminated soil act by producing a contaminated air current from the cellar up into every dwelling, but wherever filthy ground is dug up to a depth of several feet, there is danger to the health of people immediately about. In a case recently reported to this Board of Health the soil at the back of a dwelling had been the receptacle for the filth of the family for a number of years, without any apparent injury resulting. In building an addition to the house it was necessary to make a small excavation for a cellar. When the filth-saturated earth was thrown up, the whole household was taken ill. There are numberless cases of this kind on record showing the danger arising from excavations in contaminated ground.

The only way to insure health in a city is to carry away the filth produced by its population. It cannot safely be stored up in the ground of the town. The experience of the world is conclusive on this point.

On the whole, the most practicable method of transporting the filth out of a city with ample water supply is, by water carriage in proper sewers. We, therefore, strongly recommend the building of a system of sewers for the city of Kingston. The storm water of the city is provided for. What is wanted is a system of sewers to carry sewage only. Sewers constructed to carry sewage only are known as "separate sewers," in contra-distinction to "combined sewers" which carry both sewage and storm water.

The judgment of the State Board of Health has been already expressed, that small pipe sewers made to carry sewage only and thoroughly flushed by daily flushing, answer sanitary conditions better than large combined sewers. We, therefore, recommend for the city of Kingston a system of separate sewers. Such sewers not only answer more thoroughly the requirements of sanitary science, but, in the case of Kingston, they would certainly cost less than half as much as the combined system.

The lateral sewers may be made of six-inch pipe, and the trunk sewers need not exceed fifteen to twenty inches in diameter. Your city engineer, Mr. A. Grant Childs, is familiar with the separate system as it has been executed in a number of places in this country. It is important in constructing these sewers, that the work should be thoroughly well done. They will not work unless laid with precision and care, with the joints well supported. Roughness from cement on the inside of the pipe should be guarded against. It is not necessary for us to go into the details of the method of constructing these sewers since your engineer has made such careful study of the subject. For the views of the committee regarding certain modifications of the system, as it has been executed heretofore, we would refer to the report on the sewerage of Malone, copies of which are herewith transmitted.

As regards outfall for your sewers, it is evident from the topography of Kingston, that part of the city must drain into Esopus creek and part into Rondout creek. Owing to the spring floods which overflow the lowlands along Esopus creek, there are, we believe, no persons living near its channel, and the water is, we are told, not used for domestic purposes below Kingston. There appears to be sufficient water in the creek to carry off the sewage that may be thrown into it; but should any difficulty occur from the contamination of the water of the creek, it would be perfectly practicable to dispose of the sewage by subsoil irrigation and the underdraining of the ground into Esopus creek.

Mr. Gardiner selected a piece of land adapted to this purpose, which is east of Tannery brook and north of the railroad embankment. Should it be found that the outfall of sewage into Rondout creek occasions some inconvenience with the incoming tide, arrangement could be made to discharge sewage only on the ebb tide, and it could if necessary be passed through a settling tank. The outfall should be put as far east as possible from the foot of Hasbrouck avenue.

Some question was raised as to the possibility of there being sufficient grade for the main sewer along Union avenue, between the City Hall and Albany avenue, the land being so nearly flat. Regarding the minimum grades for pipe sewers, we would say, that for twelve to fifteen-inch pipe, twenty-five one-hundredths of a foot of descent to each one hundred feet of sewer is sufficient to give velocity of from one hundred and forty-seven to one hundred and sixty-six feet per minute, which is considered ample for carrying away sewage.

The discharge of a twelve-inch pipe with this grade would be about one hundred and fifteen gallons per minute, and of a fifteen-inch pipe about two hundred. In the case of Keene, New Hampshire, the fifteen-inch Beaver creek main which is nearly eight thousand feet long, has a fall of only about a foot in eight hundred feet, while the last few hundred feet at the outlet have a fall of only one foot in a thousand. We have as yet heard no complaint of the Beaver creek main having too little fall.

Most of the laterals connecting with the main in Keene have a fall of one foot in two hundred and fifty; but a few lines have a fall of only one foot in 400. The city engineer was not able to inform us as to the number of miles of street to be sewerred in Kingston, but the cost of the separate system may be roughly considered as about \$1.25 per running foot. This cost includes laying lines of drain tile through the trenches of the sewer which secures a thorough underdraining of the streets and ground about the houses.

The cost of sewerage and draining the city of Keene, where sixty-one thousand two hundred feet of sewer was required was \$74,000. About nine thousand feet of this sewer was fifteen-inch pipe, and some three thousand four hundred feet twelve-inch pipe, the remainder was ten-inch, eight-inch and six-inch.

While in some respects the separate system, as applied at Keene, is perhaps the most complete example in this country, we consider it capable of improvement in at least two particulars. At Keene the sub-soil drains are given frequent outlet into the sewers. In the judgment of the Board this is objectionable, because whenever the stoppage of a sewer occurs the sewage may be backed up through the sub-soil drains, causing more or less saturation of the soil, and also, because it allows the sewer air to pass back into the sub-soil drains. We also consider it objectionable to dispense with traps outside of the houses. The purpose of this was to give through the house drain that free access of air to the sewer which is essential to its cleanliness and to the proper mechanical working of the flushing currents in the sewer.

A constant current of air through any street sewer or house drain is of the greatest importance to its cleanliness. We do not, however, consider it thoroughly safe to allow free circulation of air between the house branch sewer and the drains in the interior of the house. Branch sewers running from the house to the street are very often more or less coated with grease and filth that adheres to them. For this reason we think it wiser to place a trap just outside

the house with ventilating pipes rising from both sides of the trap up to the roof of the dwelling. By this means the branch sewer and the street sewer are as thoroughly ventilated as if the trap did not exist and the house drain is also ventilated, provided the soil pipe is carried up above the roof as it should be.

A diagram of this plan which we approve for the ventilation of house drains and sewers is given in the board's reports on the sewerage of Malone, Peekskill and Bath. The diagram is not made to show the method of planning house plumbing which this board approves; but, as its title indicates, it simply describes a method of ventilation.

Objection has been made to the trap on account of the liability to accumulate filth. If grease traps are used under the sinks in the houses and kept clean, as they should be, comparatively little filth will stop in the trap, and this may be easily cleaned by having a six inch pipe rise from the center of the trap up to the surface of the ground, this pipe being tightly covered with a lid. Through this pipe a spoon on the end of a pole may be put down into the trap, or any other proper implement, and the trap cleaned when necessary. This is the method used by the best plumbers in Albany and is perfectly successful. A trap with outlets to the open air on each side of it will not be syphoned because of the equality of pressure.

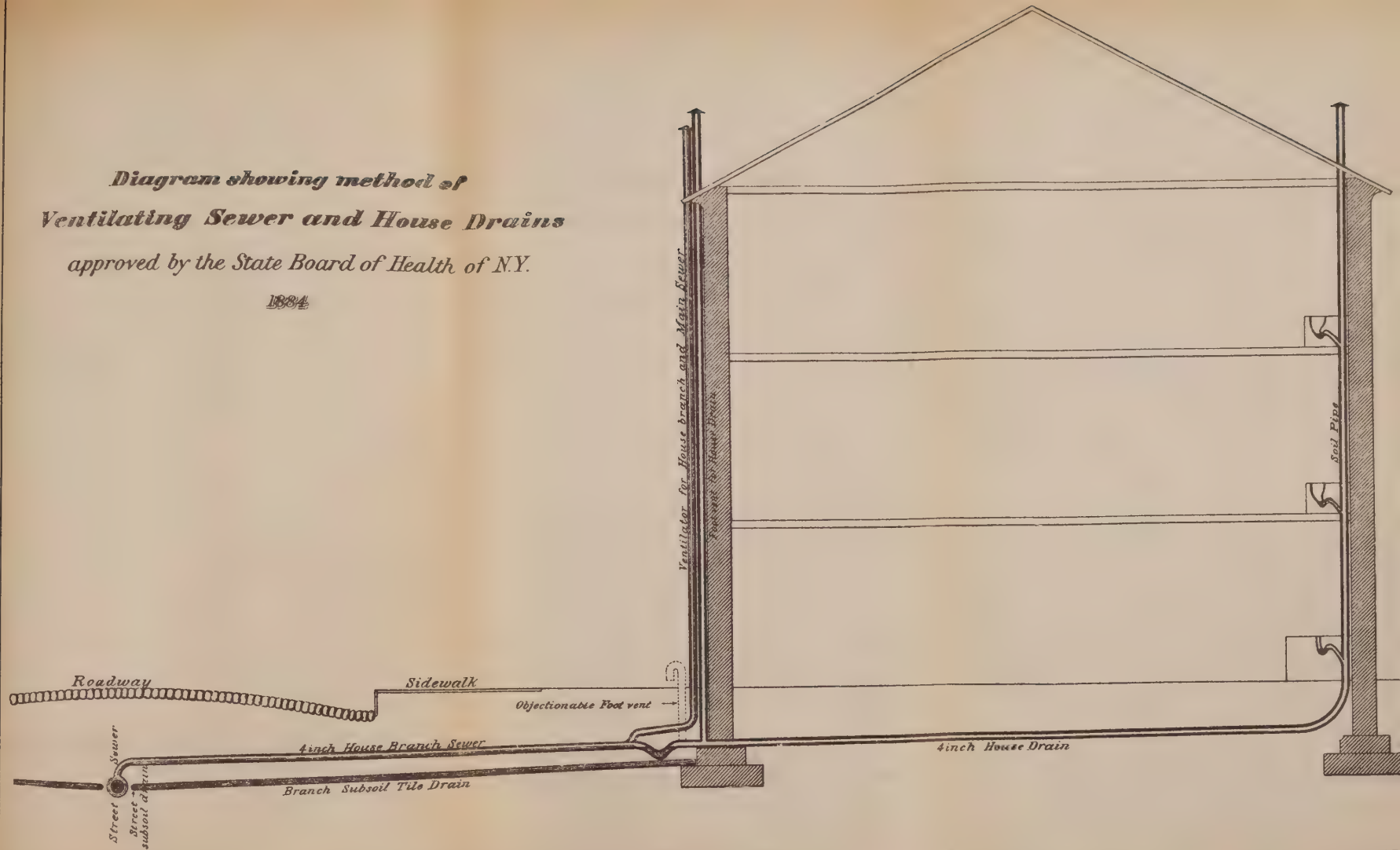
Another point to be noticed is, that the house drains and the house branch sewer from the house to the street, should not be over four inches in diameter. The smaller a sewer pipe can be and do its work the cleaner it can be kept. The water from houses does not give sufficient flush to keep clean a pipe of more than four inches in diameter. Cases are within the knowledge of this committee where eight-inch house connections have given constant annoyance from stoppage, which, when replaced by four-inch pipes, have never given any trouble.

With six-inch lateral sewers in the street it is of the utmost importance that no pipes over four inches in diameter should be allowed to connect with them. With four-inch house connections, if people are careless and throw large solid substances into house drains, they will probably stop in the trap or house branch and not go down into the street sewer. Four-inch house branches are, therefore, an essential protection to the six-inch street-sewers from the carelessness of the people.

When under proper regulation the number of cases of stoppage

*Diagram showing method of
Ventilating Sewer and House Drains
approved by the State Board of Health of N.Y.*

1884



in the separate system of sewers is so small as to offer no practical objection to the use of the system. On Staten Island there are some three miles of separate sewers under the supervision of the village engineer of New Brighton, Mr. Bustead. At the time of Mr. Gardiner's last visit to Staten Island on the 10th inst. Mr. Bustead informed him that there had never been a case of stoppage of six-inch pipes, although they had been in use between two and three years.

There seem to have been more cases of stoppage per mile of sewer in Memphis than in any other city where the separate system is used. It is possible that this is due to the very muddy character of the water supplied to the flushing tanks; but even in Memphis the number of stoppages is so small that the city engineer reports the system a success. Since Mr. Gardiner's visit to New Brighton, Staten Island, the first case of stoppage of their six-inch pipe has occurred. It was due to a tomato can, which, after passing for a long distance down the pipe, became fixed and obstructed the flow of the sewage. This can did not come through any house connection; but it is supposed that it was allowed to enter the sewer through the six-inch opening at the upper end, which is made to draw off the water at the reservoir. The grating placed there to protect the end of the sewer from such obstructions was, it is supposed, removed to allow the vegetation that had accumulated in the pond to pass off down the sewer. The exact position of the obstruction was very easily detected by an examination through the man-holes, and the running down of a wire from the nearest one to measure the exact distance from the man-hole at which to dig down to the sewer. When the sewer was opened and the can removed, the sewer pipe was found to be absolutely clean of any slime or coating and no smell was perceived. The sewer has been in use for about two years. In Memphis the cost of removal of obstructions has been about \$10 apiece.

Conclusions—In view of the facts stated, we advise the city of Kingston to construct, at once, a system of separate sewers for carrying sewage only. They should be so arranged as to be thoroughly flushed at least once every twenty-four hours, and so ventilated as to secure ample currents of air through the sewers and the house connections, independently of the house drains in the dwellings. When these sewers are done, we recommend the enforcement of most stringent ordinances to prevent houses from making connections for sewage with the storm water sewers or the open brook

channels. It will be necessary also to prevent the throwing of filth into any of these open channels. They should be kept clear for draining off the surface water. Where accumulations of filth take place from surface washing they should be removed. The keeping of these channels in a cleanly condition is, in our judgment, essential to the health of the city. No cess-pools should be allowed within the region covered by the sewers. The old cess-pools should be cleaned and filled up, and no privies should be allowed. The old vaults should be cleaned out and filled up. In addition to these measures we advise the thorough drainage of the lowland at the foot of the bank along the northern edge of the city, at least from the northern end of Union avenue to the railroad station at the crossing of Bridge street.

There are probably other and less important areas where drainage will also be valuable. We are confident that these works of drainage and sewerage, if properly carried out, will be greatly to the advantage of the health of the city. Not only will they tend to decrease the present amount of sickness from malarial and the zymotic diseases, but they will serve to prevent those severe epidemics to which every town is liable where filth is allowed to accumulate.

*Committee on Drainage,
Sewerage and Topography.*

{	JAMES T. GARDINER,	
		<i>Chairman.</i>
	GEORGE W. COOKE,	
	ERASTUS BROOKS,	
	EDWARD M. MOORE,	
		<i>President.</i>
	ALFRED L. CARROLL,	
		<i>Secretary.</i>

PETITION.

The following petition was referred by the Governor to the Board for investigation, July 1, 1884:

To his Excellency, GROVER CLEVELAND, *Governor of the State of New York*:

Your petitioners, residents of the village of Canandaigua, in the county of Ontario and State of New York, respectfully represent that the stream running through the village of Canandaigua aforesaid and the tributaries thereto, known as the "Sucker brook," which said stream is a natural water-course, flowing into and discharging its waters into Canandaigua lake, is at this time in a filthy condition, giving forth noxious and *offensive* smells, thereby rendering the health and comfort of a large number of the inhabitants of said village insecure.

That said stream known as "Sucker brook," and the tributaries thereto, flows through a densely populated portion of said village, and through the lands and property of a large number of property-owners, and that various and complicated and serious questions and disputes have arisen between the said property-owners, through which the said stream and tributaries flow, and the local board of health of the aforesaid village, which said questions and disputes have heretofore rendered the action of the said local board of health ineffectual.

That said stream known as "Sucker brook" is a natural water-course. That a large portion of the lands of said village is naturally drained by said stream. That a number of inhabitants and manufacturers drain their premises, manufactories and the refuse therefrom into said stream. That during wet times and times of high water the said stream carries a large volume of water into said lake. That during the summer months and during the dry seasons there is but little if any natural water flowing through said Sucker brook, but that the flow is nearly, if not all, made from refuse from manufactories and artificial drainage.

That in the opinion of your petitioners, the condition of said

stream and the tributaries thereto is now such that renders said tributaries and stream a public nuisance.

Your petitioners therefore pray that your Excellency require the State Board of Health to examine the aforesaid tributaries and stream, and report them to your Excellency in accordance with the statute in such case made and provided. And your petitioners will ever pray.

PETER E. BURKE, } *Board of Health*
WM. McCCLAREY, } *of said Village.*
R. D. NORTH,

HENRY W. NICHOLS, M. D., *Health Officer.*

NAMES OF INHABITANTS.

Spencer Gooding, Pol. Justice,	E. Heisenbeck,
Delos Doolittle, Justice of Peace,	William Boyle,
Avery Hemenway, att'y at law,	W. H. Foster,
Wm. Tozer,	E. H. Frary,
John S. Coe, Justice of Peace,	Jas. C. Jackson,
Thomas Thompson,	L. Y. Sheldon,
Geo. C. Beecher,	Joseph Masseth,
James R. Warren, Jr.,	C. E. Crandall, att'y at law,
Alexander Davidson, lumber d'lr,	Mortimer Slegt,
I. Wolverton, wool and grain,	DeWitt Haine, com'r highways,
Q. R. Gibson,	M. J. McPhillips,
T. Skidmore,	R. Van Vranken,
T. Eiseleia,	Dr. A. Eldridge,
A. E. Hillyer,	G. Bradley Anderson, merchant,
George A. Finley, merchant,	Wm. H. Whinall,
F. W. Alverson,	William R. Hubbell,
A. C. Smith,	Geo. N. Parmele,
L. S. Sprague, merchant,	R. D. Graves, Jr.,
J. H. Phillips, watchmaker,	Thos. H. Reilley,
S. G. Ambler, shoe dealer,	John A. Johnston,
Frank Troish, grocer,	John Widman, shoe store,
Chas. Troish, grocer,	Wm. A. Widman, "
Robert D. Latta,	F. J. Harwood, att'y & counsel'r,
E. Lines, shoe dealer,	Willis D. Newman, drug clerk,
J. H. Williams, shoemaker,	Norman R. Martin, grocer,
A. Orr, shoemaker,	C. O'Laughlin, grocer,
A. B. Levy, merchant,	Homer Chase, farmer,
Jacob Levy, "	Benj. K. Turner, grocer,
C. G. Fisher, "	Wm. D. Watson,
L. G. Levy, "	J. M. Stokoe,
Andrew Egan, "	Pierson & Benham, druggists,
Patrick Meade, butcher,	Theo. Perkins, hardware,
P. Cherry, undertaker,	L. B. Gaylord, grocer,

Peter Schlink, bookbinder,
 N. R. Boswell, carpenter,
 Jesse H. Matson, hides and leath'r,
 C. N. Brundage, agricul. impl'ts,
 C. C. Brundage, " "
 J. G. Hudson, stove dealer,
 Jas. Parsons, baker,
 Fred. S. Classey, grocer,
 Wm. Howley, grocer,
 Henry Senglaub, restaurant,
 A. Niblock, stoves, etc.,
 M. E. Ashley,
 Charles M. Coyle,
 Matthew O'Brien,
 Davidson and Park,
 H. Mutschler,
 L. Kaufman,
 Louis Mutschler,
 W. Blanchard,
 J. Drumer,
 T. O'Brien,
 James O'Brien,

Thos. Allen, grocer,
 A. Johnston, merchant,
 P. Leighton, "
 A. D. Paul & Co., druggists,
 Blanchard & Bro., butchers,
 T. B. Stephenson, jeweler,
 W. W. Tate, painter,
 H. H. Faron,
 Peter Faber,
 J. A. Brown,
 J. H. Curran,
 J. D. Smith,
 J. Carney,
 I. E. Poullson,
 Chas. H. Paddock,
 A. C. Sheldon,
 Daniel Shafer,
 William H. Ellis, Jr.,
 William Johnson,
 W. L. Hicks,
 Thomas Cunningham.

REPORT.

The whole subject was referred to the committee on drainage, sewerage and topography with power. That committee, after due investigation, transmit the following report:

OFFICE OF THE STATE BOARD OF HEALTH, }
ALBANY, N. Y., *July 19, 1884.* }

TO HON. GROVER CLEVELAND, *Governor of the State of New York:*

SIR—The petition from the board of health of the village of Canandaigua and a large number of prominent citizens of the place, asking for an investigation by the State Board of Health into the sanitary condition of Sucker brook, a stream running through the village, was referred by you July 1st, to the State Board of Health, and by it referred to the committee on drainage, sewerage and topography with power.

In compliance with these instructions, the committee make the following

REPORT.

An experienced engineer, Mr. Horace Andrews, Jr., was sent to examine the ground and report to the committee the results of his observations, together with such recommendations as might suggest themselves from the examination. The report of Mr. Andrews is appended.

It appears that Sucker brook runs through the village of Canandaigua for about a mile nearly parallel with Main street, and distant from it some 1,200 feet for the larger part of its course. The map accompanying the report shows the village and water-courses.

Sucker brook empties into the north end of Canandaigua lake, about 1,200 feet west of the pier at the foot of Main street. This pier projects into the lake about 1,300 feet. About the same distance beyond the end of the pier is the inlet to the water mains which supply the village with water. The depth of the lake at this point is eight feet. The outlet to Canandaigua lake is on the east

side of the pier, so that whatever flow comes from Sucker brook in times of high water is thrown into the lake in the direction of the inlet of the water mains, and passing around the end of the pier goes out of Canandaigua outlet. . In times of high water, there is practically very little outflow from the lake, owing to the dams on the channel.

A little over a mile up Sucker brook a branch, fed by a large spring, enters it. The water from this spring was diverted from its natural course, and carried through McKechnie's brewery. Some 800 barrels flow daily from the spring, of which, from three to four hundred barrels are used in the brewing, and the remainder flows down into Sucker brook in a very foul condition. During the summer, Sucker brook has no water, except what is received from this brewery branch. The water from the junction of the brewery branch down to the lake is of a purplish color and has an offensive odor. The odor is so strong that, on warm days, when the wind is from the west, it is said to be readily perceived along Main street.

The refuse from the brewery is said to be undoubtedly the main cause of the pollution of the stream, but a drain carrying sewerage also enters Sucker brook at Cross street. This drain is over half a mile long. How many houses empty their sewerage into it, it was impossible to learn. While the water from this drain undoubtedly increases the pollution of Sucker brook and adds the dangerous element of human excrement to it, the water of the drain at Cross street appears to the eye clear and has no odor. There can be no question that the use of the spring branch of Sucker brook as an open sewer creates a nuisance liable to injure the health of the people in two ways.

Running, as this channel does, nearly parallel to Main street, and lying only from twelve to fifteen hundred feet west of it, the emanations from the polluted water are readily wafted by the westerly winds of summer over the whole village.

A small brook full of putrefying organic matter and used as an open sewer, passing so close to the populous part of the village, may easily become the breeding ground of disease. The results of the inspections of this committee at Schenectady showed that in the neighborhood of the polluted water channel occurred a large proportion of the reported typhoid fever, diphtheria and diarrhoeal diseases. In case of the dreaded visitation of cholera, such a water-course might easily become a center of propagation for the disease.

Dangerous as are the emanations from such a polluted stream carried by the wind into every house of the village, they are not more to be feared than the fact of pouring the polluted water into the lake so near the inlet for the water mains which supply the people with drinking water. If the polluted waters of Sucker brook are allowed to enter into Canandaigua lake so near the intake for the water supply they are a constant danger to the health of the village. The fact that the quantity of polluted water is small as compared with the amount in the southern end of the lake gives no security that the water supply will not be affected. A very small amount of typhoid virus will often contaminate large bodies of water, and the same is probably true of the virus of cholera. The pollution of Sucker brook, therefore, creates a nuisance which is liable to poison both the air and the water of the village.

We unhesitatingly declare that the pollution of Sucker brook creates a nuisance which ought to be speedily abated. The remedy is a simple one. A sewer has already been laid down a part of Main street having an outlet into the artificial outlet of Canandaigua lake. This sewer extends from the intersection of Gibson and Main to the intersection of Main and Saltonstall street, when it turns eastward down Saltonstall street. The pipe of which this sewer is made is far larger and more expensive than is necessary for carrying sewage only.

The sewage of the brewery can readily be brought into the Main street sewer by a pipe not over three-quarters of a mile in length. A pipe from six to ten inches depending upon the fall will carry all the material from the brewery into the Main street sewer, whence it will be carried into the outlet of Canandaigua lake, some three-quarters of a mile below the lake.

The drain entering Sucker brook at Cross street would also be tapped by this sewer. It would follow approximately the line of the railroad. In the absence of a system of leveling over the village, the exact line for this sewer cannot be told. Canandaigua should at once have made a complete plan for a sewerage system which can be carried out as demanded by different parts of the village, and which when complete shall form a perfect and harmonious whole. A great deal of money will thus be saved to the town, and the results from a sanitary point of view will be far more satisfactory than if the sewerage is proceeded with piece by piece without any well-digested general plan for the work.

There is a large tract of swamp land of some two or three hun-

dred acres at the south-east corner of the village which is doubtless unwholesome; a plan for its drainage should also be made.

The backing up of the waters in the outlet of Canandaigua lake by the dam at Chapinville, some distance down the stream, may in time of high water cause difficulty with the outflow of the sewage from the sewers, and in case of a back current from the outlet into the lake the sewage might injuriously affect the water supply.

A water supply for Canandaigua village is just being introduced. With the free use of water which will soon begin, the want of a thorough plan for sanitary sewerage and drainage will be very much felt. If sewerage and drainage are neglected after the water supply has been introduced the health of the village will undoubtedly suffer.

We, therefore, recommend that in considering the disposal of the brewery sewage and the purification of Sucker brook these matters may be made simply a part of a general consideration of a complete and approved plan for the sanitary drainage of Canandaigua.

Respectfully submitted,

JAMES T. GARDINER, Chairman,	} <i>Committee.</i>
ERASTUS BROOKS,	
GEO. W. COOKE, M. D.,	
EDWARD M. MOORE, M. D.,	
ALFRED CARROLL, M. D.,	
President,	
Secretary.	

REPORT ON MATTERS RELATING TO THE SANITARY CONDITION OF
CANANDAIGUA.

JAMES T. GARDINER, *Chairman of Committee on Drainage,
Sewerage and Topography:*

SIR — As requested, I have examined into the causes and methods of prevention of certain nuisances in the village of Canandaigua, and herewith submit my report with accompanying map:

The village of Canandaigua is situated at the foot of Canandaigua lake upon land which rises gradually from the lake. The main street of the village, which runs in a northerly direction from the lake, is nearly on the summit of the streets which cross it at right angles, the land falling to the east toward the outlet of the lake and to the west toward Sucker brook, which flows into the lake a short distance only from the outlet.

Sucker brook has a water-shed of seven or eight square miles, but during the summer the flow would cease entirely if it were not for the reinforcement it receives from several springs within the corporation limits. The largest of these springs is in the northern part of the village, the water from it flowing southerly for about one mile before joining Sucker brook.

The water from this spring has been diverted from its original course and it now runs into McKechnie's brewery, where about half of it is consumed for brewing purposes, while the remainder, estimated at from three hundred to four hundred barrels daily, flows out of the brewery in an exceedingly foul condition.

There are several other drains flowing into Sucker brook, which thus becomes an open sewer, though flowing through pastures where in some places it seems to be the only available water for the cattle to drink. A large drain flowing through the thickly settled part of the village receives a considerable amount of sewage, but the solid matter is almost entirely deposited before it enters Sucker brook at Cross street.

Another drain enters the brook at Bristol street; very little drainage is discharged from it, however. The purplish color and offensive odor of the water from the brewery are very apparent throughout the entire length of Sucker brook from the point where the brewery drainage enters it. The matter discharged from the other drains does not appear to be at all offensive, while the odor from the brewery refuse is exceedingly disgusting and at times becomes an intolerable nuisance to the whole village.

A cement pipe sewer has recently been laid along Main street, from Gibson street to Saltonstall street, thence it runs along Saltonstall street and discharges into the new outlet of Canandaigua lake, permission having been obtained from the owner of this new artificial channel. The sewer in its upper part is egg shaped and of an area equivalent to that of an eighteen-inch round pipe, while in its lower part it is of the same shape and its area is that of a thirty-inch round pipe.

The new outlet into which the sewer empties was designed to shorten the course of the old outlet of the lake so as to give a better supply of water at Chapinville, about three miles from the lake, where a fall of ten or twelve feet occurs. The entire fall from the lake to the top of the dam at Chapinville is said to be only about eighteen inches, and in times of high water the sewage will be dammed back up Saltonstall street, and there seems at present to be no method of draining the southern part of the village in times of flood.

The remedy for the nuisance, caused by the brewery refuse, that is most readily suggested with the present system of sewerage, would be a pipe drain of from six to ten inches diameter, running from the brewery along the railroad track to a point below Gibson street, whence it could follow the natural contour of the ground and enter the Main street sewer near the Town house, or a short distance below it.

As the Main street sewer has been placed ten feet below the surface of the street in order to effectually drain the neighboring cellars, and since the proposed drain from the brewery would require to be but a little below the frost line, a fall of from twenty to twenty-five feet can be readily secured in a distance of about a mile which would be the entire length of drain required. The brewery sewage would then be as well disposed of as that of the rest of the village, and the nuisance arising from the foul odor would be done away with.

It is at once apparent that the sewerage of Canandaigua is very inadequate and there is no general plan looking to the further extension of the system.

The sewers at present constructed are intended for the reception of sewage exclusively and not for storm water, and they are much too large for their intended purpose. As an illustration of this fact it may be mentioned that the entire sewage, without storm water, in a district of St. Louis containing 1,370 houses occupied by a population of 8,200, was carried through a twelve-inch pipe filled to a depth of less than seven inches. The discharge in this case was over 1,000,000 gallons per day, or 130 gallons for each member of the population.

It would be far more economical in the end for the inhabitants of the village to cause a good survey and plan for sewerage of the village as a whole to be made, than to proceed to place sewers in the streets without any definite ideas regarding their connection with one another or the amount of sewage they will be required to carry. It would also seem very inadvisable to discharge any of the sewage of the village into the lake when it can be so readily emptied into the outlet, thus obviating any possible contamination of the water supply.

A plan has been advocated which seems quite feasible and which demands most careful consideration, by which the lower part of the village could be well drained and at the same time the extensive swamps near the outlet, covering two hundred or three hundred acres, which now are nearly worthless for agricultural purposes and are probably injurious to the health of the community, could be reclaimed.

This plan is for the village to acquire the water rights at Chapinville, to remove the dam there and to deepen the new outlet of the lake until the necessary fall can be secured. A dam could be placed across the outlet near the lake, thus preventing its present level from being disturbed and at the same time creating a water power at that place. The swamp land could then be ditched and drained and a good outlet also secured for any proposed system of sewerage.

I would call attention also to the covered ditch draining into Sucker brook at Cross street. It would seem advisable that a drain pipe should be laid in its place unless some thorough system of sewerage should be perfected, when it could be used merely for storm water. At present this covered ditch may readily be a cause of sickness and a means of propagating disease. Some of the sewage

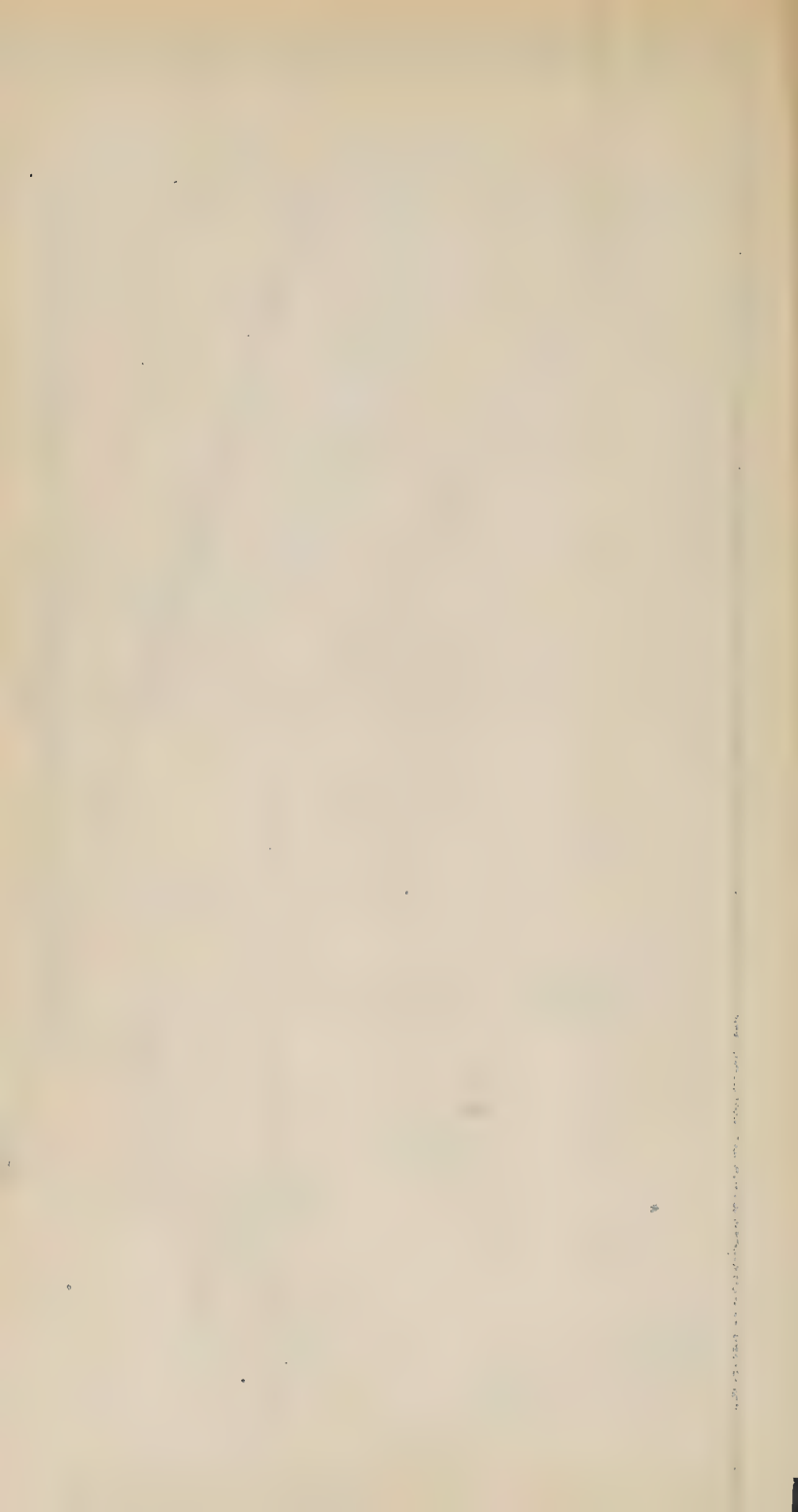
CANANDAIGUA

Scale 1 in. to 1000 ft.

Accompanying report to the State Board
of Health of New York on the sanitary con-
dition of the village. July 9th. 1884

By Horace Andrews Jr. C.E.





now flowing into this covered ditch could be carried off in the present Main street sewer.

Since the existing sewer is of such large size, it would be well to flush it at intervals either by letting in a certain amount of storm water or preferably by means of an automatic flushing tank placed at its upper end.

Mains for water supply have recently been laid and a reservoir is now being constructed near the northern limit of the corporation at an altitude of about one hundred and forty feet above the lake. The water from the lake will be pumped into this reservoir and soon the village will be abundantly supplied.

The present time would seem to be a peculiarly appropriate one for this large and flourishing village, which has a population of nearly six thousand, increasing at the rate of about one per cent a year, to secure a system of sewerage which will not only be adequate to its present needs, but which may, from time to time, be extended according to some well preconceived plan as the population increases and a due regard to the sanitary condition of the community calls for such extension.

HORACE ANDREWS, JR., *C. E.*

ALBANY, *July* 12, 1884.

CHEMUNG CANAL.

PLAN FOR DRAINAGE OF THE SUMMIT LEVEL OF THE CHEMUNG CANAL PRISM FROM HORSEHEADS TO PINE VALLEY.

STATE BOARD OF HEALTH OF NEW YORK, }
ALBANY, *September 17, 1884.* }

TO HON. JAMES SHANAHAN, *Superintendent of Public Works :*

DEAR SIR — Under chapter 105 of the Laws of 1884, “ the sum of \$5,000, or so much thereof as may be necessary, is hereby appropriated for the purpose of draining the prism of the late abandoned Chemung canal within the limits of the town of Horseheads, and in the removal of obstructions to and in the making of an outfall for said drainage. This money is to be expended by the Superintendent of Public Works under the advice and direction of the State Board of Health. Such drainage ditches, culverts, outfall and other work necessary shall be of a permanent and lasting character.”

In accordance with this law, the State Board of Health directed Mr. O. S. Wilson, a civil engineer of experience, to make a survey of the ground and to prepare a plan for the drainage of the prism of the abandoned canal within the limits of the town of Horseheads. To drain all of the canal prism that lies within the limits of the town of Horseheads would probably cost much more than the sum appropriated. Since this work was to be executed by the Superintendent of Public Works under the direction of the State Board of Health, it must be considered that the purposes of the work are sanitary, and, in deciding where the money should be expended, it is necessary to take into consideration where the greatest amount of harm is now being done to the health of the people of Horseheads by the existence of the undrained canal prism.

Mr. Wilson has submitted his report with maps, and the whole subject has been referred to me with power. The State Board of Health has directed me to transmit to you my conclusions as the conclusions of the Board. I have visited the ground in company with

Mr. Wilson and carefully considered the plan presented by him, and at a hearing in Horseheads on the 12th inst. I heard the village authorities, the physicians and also Mr. Westlake's objections to the execution of the plan.

Mr. Westlake's objections were based upon the statement that the draining of the canal prism would lower the water in the wells upon which his works depend for water. It appears, however, according to his statement, that he could obtain water at certain large springs situated near the lock of the old canal feeder, but that he would be put to the expense of pumping the water up to his present works.

The condition of the canal prism north of the railroad embankment is this: The water in it is spring water, having a perceptible flow, but the current is not sufficient to prevent the growth of an enormous amount of vegetation in the abandoned canal prism, which immediately north of the railroad embankment is the property of the State. A large amount of malarial diseases certainly exist in the immediate neighborhood of this prism, and it is probable that the decay of this luxuriant growth of water vegetation is one of the elements affecting the health of the people of Horseheads who live in the immediate vicinity.

While it does not appear that the condition of this part of the prism is the only unsanitary condition likely to produce malaria in this part of the town of Horseheads, yet it is probably an important source of harm. The portion of the canal prism lying immediately adjacent to the village and directly north of the railroad embankment are undoubtedly the parts which are most liable to injure the health of the greatest number of the people. It is, therefore, my opinion that the drainage of these parts of the prism is the most important from a sanitary point of view.

It is to be regretted that the interests of Mr. Westlake may be interfered with by this withdrawal of the water from the channel of the canal; but if it be a question whether the health and lives of a large number of the citizens of Horseheads are to be even endangered by the maintenance of this water in the canal, or that Mr. Westlake should be put to the expense of pumping water to his works, I think there can be no question on sanitary grounds that Mr. Westlake should incur this added expense rather than that the lives of his fellow townsmen should be risked.

I, therefore, advise you from a sanitary standpoint, the only grounds upon which this Board can consider the case, that the most important part of the canal prism to be drained is that part lying

between the saw-mill and the E. C. & N. R. R. embankment, and immediately north of that embankment.

I have considered this matter with the Attorney-General and it appears that the State will be in no ways liable for withdrawing the water from this canal prism. The Supreme Court and the Court of Appeals have decided that the law controlling the rights to subterranean waters is very different from that affecting the right to surface streams. In the former case the water belongs to the soil, is part of it, and is owned and possessed as the earth is, and may be used, removed and controlled to the same extent by the owner. No action will lie for injuries caused by cutting off subterranean waters percolating the soil or running through unknown channels and without a distinct or defined course.

The only connection between the canal prism and Mr. Westlake's wells is by means of the subsoil water. The State has, therefore, full right to drain its lands without reference to the effect of the subsoil waters of adjacent property.

Mr. Wilson's plan, which is herewith transmitted, includes various provisions for the draining of surrounding swamp land, for the maintenance of certain ponds in the old prism of the canal by private parties, for the diversion of Mud brook, the supply of the tannery with water, and also for making provision for a supply of water for fire purposes for the town of Horseheads. While these are matters which interest the citizens and are doubtless of importance to their health, they are not proper subjects for the expenditure of the appropriation which was made by the State, which is limited by the words of the act to the draining of the prism of the canal.

Mr. Wilson's plan provides for the laying of a large drain pipe from below the mill-dam to the point north of the railroad embankment and for the preservation of the channel in the canal for receiving overflow of storm water. The canal prism must either be drained by surface ditching or by underground drains. The law requires that the works constructed with the appropriation shall be of a permanent and lasting character.

Observation on the growth of vegetation and the rapid silting up of any surface ditch along the prism of the canal leads me to conclude that an open ditch would not be a work of lasting and permanent character within the meaning of the law. I, therefore, approve of laying a large drain of salt-glazed vitrified pipe from a point below the mill-dam to a point north of the E. C. & N. R. R.

embankment, and of the laying of any agricultural tile drain in conjunction with this for the under drainage of the canal prism.

This drain should have a suitable catch basin at its northern end and should be properly provided at intervals with man-holes for the inspection of the sewer. As to the size of this pipe it should be eighteen or twenty inches according as the appropriation will allow, and should be circular in form. This will be sufficient to carry off all the water throughout the greater part of the year; while exceptional floods must be carried off by a surface ditch.

The cost of building this sewer under the railroad embankment should probably be borne by the railroad company, as it does not appear upon what authority they have filled the channel at this point.

After properly draining that portion of the canal prism which lies in the immediate vicinity of the village, if any of the appropriation remain it should be expended in draining the level beyond the summit dam, a plan for which is submitted by Mr. Wilson and approved by me.

On your giving notice to the Board that you are ready to begin the work, Mr. Wilson will be directed to be upon the ground and advise and direct as to such matters as come properly within the supervision of this Board.

Respectfully,

JAMES T. GARDNER,

Chairman of the Committee on Drainage, Sewerage, and Topography.

MR. WILSON'S REPORT.

Chairman of the Committee on Topography and Drainage of the New York State Board of Health:

SIR— I submit the following plan for draining the summit level of the abandoned Chemung canal:

A few years since the divide was located and marked by a dam built across the canal. I have naturally considered the drainage of this level in two parts.

First. From the summit dam south into the village of Horseheads.

The natural drainage of this part of the valley is Newtown creek, which, coming from the north-east, flows southerly along the eastern boundary of the corporation of Horseheads and empties into the Chemung river near Elmira.

NEWTOWN CREEK.

This stream is from fifty to eighty feet wide, with banks from two to four feet high, and while in summer it is a very small stream, running mostly through the gravel, in time of spring freshet it overflows its banks and the low land along its course.

The mill-dam having been maintained for so long in front of the village, a great amount of coarse gravel has been washed into the mill-pond. The map gives the elevations of the creek bottom from the lower end of the tail-race to the E. C. & N. R. R. bridge above the village.

Mud brook rises east of the summit dam and is now carried in drain tile until it strikes the fish pond on the land of Benjamin Westlake. It then flows through an open ditch along the east side of the canal, passing under the tannery and into the canal prism. Before the canal was constructed it flowed near the bed of the present canal, southerly to a point about midway between Franklin street and the saw-mill, and there joined Newtown creek above the mill-dam. When the canal was constructed the brook was turned into the creek near Franklin street bridge. It has a small watershed, and in summer would flow through an eight-inch pipe. At present the canal and Mud brook are connected above the railroad embankment.

A brook having quite a large water-shed came into Mud brook near the railroad embankment from the west, but this was taken into the canal feeder. In time of freshet this brook becomes quite a torrent, but subsides quickly. Above the lock the feeder is dry. In the lock is a very large spring. Quite a number of springs were intercepted by the canal and still remain the main source of the summer supply of water in it.

SOURCES OF MALARIA IN HORSEHEADS.

Before the building of the canal, in 1832, the country was generally wooded, and the storm water passed off slowly, keeping the streams above mentioned more even, and with steadier flow keeping the lowlands along the streams saturated continually. Had the canal not been built it is probable that, as the land was cleared of timber, these streams would have lowered as they do now, and the same malarial influences existed years ago. By the building of the canal and keeping the same filled during the summer months with comparatively pure water from the feeder, and at a higher level than the natural water-courses, the leakage from the canal kept the low-

lands in this immediate vicinity saturated, and there was not the rising and falling of water which on marsh land is so productive of malaria. It is evident that the canal only postponed until now what would have naturally occurred a generation ago; unless possibly the canal increases the evil by adding somewhat to the exposed fluctuating water surface. In my judgment the sources of malaria here are as follows:

1st. The canal prism from the summit dam southerly.

The water in the canal is polluted in several places by filth emptied into it and deposited along its slightly fluctuating banks.

2nd. The marsh land to the east of Mud brook.

This without doubt is the greatest source of malaria in the village.

3rd. The lowlands east of Newtown creek.

As long as the mill-dam exists these flats will be saturated and dry as the mill-pond is filled and lowered in using.

4th. The canal prism from the summit dam northerly.

For a mile or more the water in the prism is in a bad condition as the water is more stagnant. With a favorable wind its miasmatic influence may be felt at Horseheads.

I will make a few statements covering the first three causes, then give a plan for removing them. Leaving the fourth cause for after consideration.

WESTLAKE'S WELLS.

The summit dam is at the north line of property owned by Benjamin Westlake. He owns land both sides of the canal about 3,100 feet south of the dam. He has stocked the canal with fish, graded the banks and planted small trees along both sides, thus intending to improve the canal bed for the benefit of his property. He also has an extensive brick yard west of the canal. (Buildings shown on map.) In washing his clay he depends for water on two large wells about 300 feet deep. I found by leveling that the surface of the water in his wells was but 1.35 feet above the present surface of the water in the canal. He fears, and it is undoubtedly true, that to lower the water in the canal would lower the water in his wells about the same amount during the dry summer months. For this reason also he desires to hold the water in the canal about where it is, through his property, and is willing and ready to keep it in a healthy condition. This section of the canal is fed by numerous springs of pure water, and in quantity sufficient to keep a current through it. I see no objection to this being left at the

present level, provided the water is not contaminated with refuse of any kind. The location of the wells in the buildings is indicated by red dots on the map. It may be well to state here that the formation is such as to render the deepening of the wells impracticable as a means of obtaining more water.

THE CANAL FEEDER.

From the center of Main street bridge to Lock No. 1 the owner desires to retain the water as it is, as he contemplates improving the canal banks with trees, etc.

The village now depends mainly upon this water for fire purposes, but that I shall consider later. The water in this section is supplied by large springs near the lock.

McCOMBER'S TANNERY.

Mr. Andrew C. McComber now, as for the past fifty years, uses Mud brook in his tannery, and its channel cannot be molested without his consent. He has, however, agreed to allow Mud brook to be taken from him, provided he be supplied with water in equal or sufficient quantity for tannery purposes. In the following plan provision is made for water sufficient for his purposes, to be conveyed in eight-inch iron pipe from the feeder above Main street bridge to his vats, and the waste water from said vats conveyed into the sewer in the canal bottom. It would be expedient if Mud brook is to be deviated or disturbed, before any work is done, to have an agreement, in writing, duly signed and recorded.

MILL PRIVILEGE IN NEWTOWN CREEK.

A few months since the mill owned by Mr. Kline and others was burned. The privilege of maintaining a dam in Newtown creek of eight feet in height can now be purchased at a reasonable price. It is desirable and almost necessary to any complete plan of drainage, that the dam should be taken out of the creek and kept out forever. I have taken for granted that the village and town authorities will not let so favorable an opportunity pass of ridding themselves of the mill-pond in front of the village.

VILLAGE FIRE AND SEWER NEEDS.

In the following plan I have taken into account certain things the village authorities desire, having been informed that they are willing to assist financially in carrying out the plan so as to include these

additions. They wish to have the sewer pipe extended to the upper side of the railway embankment, instead of being terminated lower down, as previously planned; also that the upper end of said sewer be low enough to enable the owners to drain the marsh east of Mud brook; also to enlarge the sewer somewhat to allow them to let the storm water from the streets into it, and also incidentally to provide points in front of the village for a supply of water for fire purposes.

PROPOSED PLAN.

I propose to lay an eighteen-inch sewer pipe, commencing at the head of the tail-race of the old mill, thence to a point in the canal prism, crossing the E. C. & N. R. R. a little north of the stone culvert, thence along the canal prism, a little east of the center of the same, to the upper side of the railroad embankment across the canal, giving the said sewer pipe a fall of about one foot in 800 feet. This will give a fall above the railroad embankment of about five feet from the present water surface, to the top of the sewer pipe for the purpose of draining the marsh east of Mud brook. In order not to disturb the water in Mr. Westlake's wells, I favor the building of a dam where his south line crosses the canal, also for this reason and those previously given, to construct a dam across the feeder under the Main street bridge. These dams should be built with the center on top lower than the sides, so that the normal overflow can be carried in a small stream near the center of the bottom of the canal prism, to the catchment basin.

An apron of stone or wood should be constructed for the water flowing over the dam to fall upon, to guard against a pool being formed below the dam. At the end of the main sewer above the railroad embankment, a catchment basin should be constructed about six by ten feet in size, the sides to be laid up with stone and the bottom of plank or paved with stone. Said bottom to be about two feet below the bottom of the sewer pipe. This will provide for the gathering and settling of water coming from the dam referred to above, and also from Mud brook and the adjoining marsh.

SUBSOIL DRAINAGE.

Along the west side of the sewer pipe beginning just below the railroad embankment, a line of six-inch horse-shoe drain tile should be laid. This tile should be placed on a board about eight inches

wide and as low as the bottom of said sewer pipe and about a foot west from it. Said line of tile to be continued along the sewer pipe to the end of the same. Any springs on either side of the canal that develop when the water is drawn off should be connected with this drain by branches of drain-tile, the connections to be made in such a manner as not to dam up the main drain with mud, etc. The blue lines on the map in the canal bed show some probable branch drains that will be needed in draining the wide water above the saw-mill.

TO PROVIDE FOR FRESHETS.

The culverts that now exist through the street and railroad crossings are neither low nor large enough to carry the water that may have to be provided for in time of spring freshet. After the main sewer and drains are put in, gravel should be drawn into prism to cover the silt in the canal bottom; this should be graded to allow a low, narrow channel for water near the center of the canal bottom, the sides sloping upward to the canal banks. Above the railroad embankment gravel for this purpose can be obtained from the tow-path, taking off the side next to the canal, leaving a width on top of tow-path of three or four feet to serve as a dyke if needed. Below the railroad embankment gravel can be readily and cheaply obtained from the bed of Newtown creek, and at the same time taken out in such a manner as to deepen and improve its channel.

Through the street crossings new culverts should be made at least three feet wide and six feet deep with the bottom of the same laid with plank or stone, said culvert to be at the center of the canal west of the line of the sewer, and not over it in any place. Through the railroad embankment there are now two lines of oval sewer pipe twenty-two inches by twenty-eight inches which have settled out of shape. These should be relaid and lowered about three feet and placed near together. This work can be done when the embankment is dug through for laying the sewer pipe.

Through the railroad above the saw-mill is a stone culvert, which should be lowered about four feet. From this culvert the channel for freshet water can remain about as it is with the necessary deepening. This will provide for any water the main sewer is unable to carry and will be used for that purpose but for a short time during an ordinary year, the sewer and system of drains will keep the upper channel dry during the summer, and prevent an accumulation of water on the surface to stagnate.

WATER FOR THE TANNERY.

To provide water for Mr. A. C. McComber's tannery, I propose that a pipe of cast iron eight inches in diameter be laid from the dam under Main street bridge, along the railroad embankment to the opening through the same for the sewer, then making an angle of about 120 degrees pass through said embankment crossing just over the sewer pipe, thence in as direct a line as practicable to the vat where the water is now used. From said vat a six-inch pipe to be laid directly to the sewer pipe and enter the same near the top. Both pipes near the vat, where it suits Mr. McComber best, to be provided with gates of cast iron to enable the flow into or from the vat to be regulated at will. The pipe to turn with falling grade from the dam to the vat, and from the vat to the sewer, and to be covered with earth the whole distance; the end of pipe above the dam to be at least one foot above the level of the top of the sewer, where it is crossed by said pipe, and to be provided with a screen to prevent any thing but water entering it.

WATER FOR FIRE PURPOSES.

The village is provided with a steam fire-engine and the canal and feeder is the main dependence for water for extinguishing fires. The drainage of the canal would cut off most of the supply for this purpose.

I propose in addition to the dam under Main street bridge to put man-holes in the line of the sewer at Ithaca and Franklin streets and at one point farther down at the discretion of the village authorities. (The design of the man-hole is shown on the map.) These will furnish all the water needed over the area now reached from the canal.

DRAINAGE OF MUD BROOK AND MARSHES.

As shown by the map the marsh east of Mud brook is owned by three separate parties. As one of the main objects of this plan is to provide an outlet for draining said brook and marshes for sanitary reasons, I would suggest that the owners of said marshy land be required to drain the same as soon after the outlet is provided as possible, and to so run their ditches as to deliver into the basin at end of sewer, as little mud and debris as possible, and advise that a written agreement to that effect be made and recorded before this work is commenced.

COST OF CARRYING OUT THIS PLAN.

As the west side of Newtown creek is the corporation line, the mill-dam being out of the corporation, if purchased would be a charge to the town. In case the town should refuse to buy said dam and the upper end of the tail-race not be obtained for the lower end of sewer pipe to terminate, said pipe could be carried about 200 feet, more or less, farther down along the west side of the tail-race and emptied into it. I trust, however, that the town authorities will not be so short-sighted as to allow this opportunity to pass, of obtaining possession of this dam, and thus do away with the mill-pond for all time.

If the sewer ends as planned, the upper end of the tail-race should be dammed up to prevent the high water in the creek from flowing through the tail-race and depositing gravel, etc., in it, and in this way keep the tail-race clear for the water passing through the sewer.

As Mr. Westlake wishes to retain the water in the canal through his land, he will doubtless claim the privilege, as it is evidently his duty to build a suitable dam to hold it. As owners adjoining the feeder and the village authorities desire to hold water in the same, they will doubtless arrange to build the dam necessary to hold said water.

The owners of the marshes east of Mud brook will be benefited by the outlet for the drainage of the same, and should arrange to defray in whole or in part the expense of providing Mr. McComber with water as planned above, about \$400.

The E. C. & N. R. R. has obstructed the flow of water from the canal with embankments, and should be asked and if necessary required to pay for the excavation and pipe through their embankments, and aid in any way they can to expedite such work when executed. The village authorities will esteem it a privilege to pay for the three man-holes as planned for fire purposes, about \$100.

Believing that the plan given above will meet the wishes of the local authorities and add very materially to the sanitary condition of the village, I have been led to plan for a more expensive work than would be really necessary to drain the canal prism, and I trust the village authorities will not hesitate to lend their aid in every way to carry out said plan, should it be accepted by you.

The cost of the sewer will be regulated by the kind and size of pipe used. It is my judgment that first quality salt-glazed vitrified

sewer pipe will be the cheapest in the end all things considered, and that eighteen inches, internal diameter, is the best for the purpose.

ESTIMATE OF MATERIAL AND LABOR.

Two thousand five hundred and fifty feet of 18-inch sewer pipe, at \$1	\$2,550 00
Four hundred and fifty feet of 8-inch cast-iron sewer pipe, at 70 cents.....	315 00
One hundred feet of 6-inch cast-iron sewer pipe, at 35 cents	35 00
One 8-inch gate, cast-iron.....	31 00
One 6-inch gate, cast-iron.....	22 00
Three thousand 6-inch horse shoe drain tile, at 60 cents.	180 00
Two thousand feet of hemlock boards 8 inches wide, at \$12.50	25 00
Laying 2,550 feet of sewer pipe, at 50 cents.....	1,275 00
Laying 550 feet of iron pipe, at 10 cents	55 00
Laying drain tile	55 00
Drawing gravel into canal bed.....	500 00
Catchment basin at end of sewer	50 00
Westlake's dam	100 00
Main street bridge.....	150 00
Two street culverts, at \$75	150 00
Mill privilege in Newtown not more than.....	1,000 00
Three man-holes.....	100 00

Second. From the summit northerly toward Pine Valley.

In order to consider intelligently the plan for draining this portion of the canal, I found it necessary to have more information regarding the topography than was available, consequently I ran levels and mapped with sufficient detail the valley from the summit dam to the mill-pond at Pine valley, a tracing of which accompanies this report. There seems to be a slight difference of opinion as to whether the summit dam, as constructed, is really on the "divide." As it is not easily determined now just where it may have been before the canal was started, within a hundred feet more or less, I have assumed that its present position is about as near the true one as can be determined.

When this country was first settled, and indeed until within ten or twenty years, this valley, from the summit dam to near where

Catherine creek comes into it from the east, was a marsh grown up with bushes and coarse grass and weeds. Although kept wet by springs there was no channel or brook through it. As will be seen from the map the canal was dug below the surface of the ground on either side, and when said canal was abandoned a fall of from six to two feet was provided for drainage purposes as far down as the town line. Some of the owners of the swamp land have taken advantage of this and drained and subdued this muck and made it very valuable for garden purposes, raising onions, celery, etc. Some of it nets ten per cent on \$1,000 per acre annually. There is at present about two feet of water in the canal prism. The canal is crossed in several places by public and private roads, and the culverts through them are, with one exception, too narrow, and the bottom of them too high, to allow the water to move freely. The N. C. railway keeps near the canal on the west side for about three miles, and where railroad culverts deliver the water from the west slope of the valley into the canal more or less filth is deposited in the bed of the canal, tending to dam the water back; the same may be said of the mouths of the ditches from the east side.

The channel is about thirty feet wide, with growing vegetation along the sides and in the bottom, which also tends to keep the water still. As a result there is little or no current and the water is stagnant and a fruitful source of malaria. Three years ago the State dug a ditch from a cut made through the tow-path, on lane of Mr. Banks southerly to Dean's bridge, or the town line between Veteran and Horseheads. This ditch for the lower half of its length has confined the water during the summer months to its bed, about four feet wide, and has a slow current through it, while its upper part is silted full, or nearly so, and its beneficial effects nearly destroyed. From the north end of the State ditch, north to Pine valley there is very little water in the canal, and with a cut through the tow-path, and a shallow ditch in the canal both ways from said cut, the prism could be rendered dry.

A plan that will clear the upper end of this level of its stagnant water will make the country adjoining healthful, so far as the canal is concerned.

As will be seen from the profile which is projected at the bottom of the map, Catherine's creek enters the valley higher than the canal opposite, and reaches the level of the canal bottom about opposite Dean's bridge.

It is evident that the stagnant water in the canal must be taken down through the bed of the canal, or delivered into the creek. There is a fall of fourteen and four-tenths feet from the surface of the water at summit dam (water two feet deep) to the normal surface of the mill-pond at Pine valley. A ditch cut through the canal with uniform grade will be quite deep along the lower half of its length, and will require for excavating and bridges over it, at least \$10,000. Such a plan is necessarily barred from present consideration. The people interested are not yet sufficiently enthusiastic to combine for such an extensive expenditure, although the land that could be reclaimed by such an outlet would well repay twice the expense necessary. It is my opinion that to deepen and straighten the creek channel will be the cheapest, most natural and feasible way to drain this valley, and I have no doubt but that will be the plan adopted sometime in the future. For the present as I am limited to the town of Horseheads, I herewith submit a plan for draining the south end of this level in such a way that the labor expended now will be available when any comprehensive plan for draining the whole valley is carried out.

PLAN.

On the land of Mr. Donald, the spoil bank containing the material taken from the canal when it was dug still remains, overlaying the natural muck. I would suggest that this be taken back into the canal and so distributed that the south end of this level be filled up three feet, and a channel formed in center of canal, *i. e.*, midway between the blue lines about four feet wide on the bottom, with sloping banks, the grade of the bottom being about as shown on the profile; which will give a reasonable fall to lateral land drains; and that the filling and narrowing of the water channel be carried on northerly, until the cut through the tow-path, above referred to, is reached. It will be necessary for all roads crossing the canal to be provided with large and deep culverts, and for all drains emptying into it to be so provided with settling basins as to keep, as far as possible, all silt out of the water channel of the canal; each owner to see that they as well as their neighbors keep the bars from forming and the channel free as possible from all obstructions.

Material for filling and narrowing the canal can be readily obtained along most of its course.

If this plan is faithfully carried out, it is my opinion that but little water will remain in the channel or ditch, and what there is will have a current even with the limited fall available. The ditch might be

carried farther down in the canal and let into the creek farther north than at present, instead of letting it in where it runs now. With a little clearing of the creek channel of brush, pond-lilies, etc., and taking the precautions mentioned above, I am confident that with a small sum of money, the nuisance that now exists will be abated.

If the work at the Horseheads end of this level is economically done, and receive the promised support of the village, there should be from \$500 to \$1,500 available for this work. This stagnant water is a source of malaria and disease and should be drained away.

CONCLUSION.

It has been my desire to design this work for the present and future health of the people living in the vicinity of the canal. Should there be a failure on the part of the village of Horseheads to assist in carrying out to completion the plan given above, it might be necessary to leave out the sewer, from near the railroad culvert above the saw-mill, to the upper side of the railroad embankment, and put a receiving basin at the upper end of the sewer, which would be shortened to 1,000 feet.

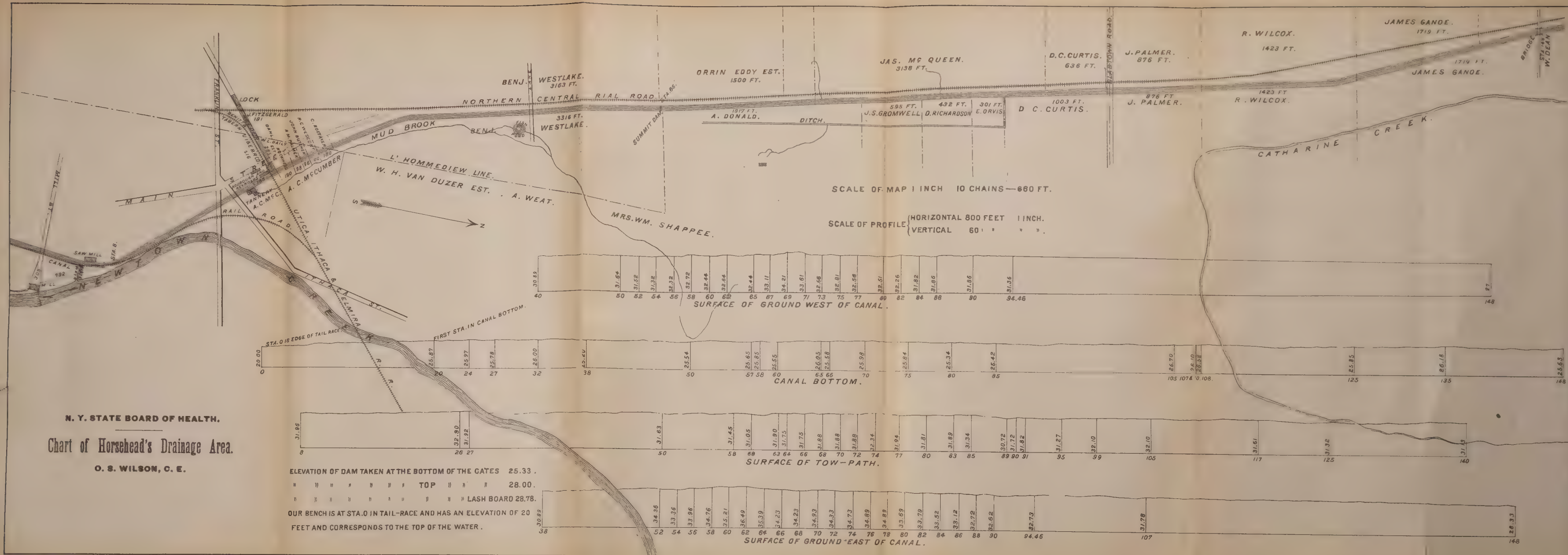
The center of the canal from said basin to the upper side of the railroad embankment should be deepened to allow the water to run on the surface in a narrow channel about six feet wide on the bottom. The balance of the plan proposed, except that designed for the especial benefit of the village, *i. e.*, the man-holes and a dry canal bed in summer could be carried out.

There would be about five feet available fall, above the railroad embankment, for draining Mud brook and the marsh adjoining, which contains fifteen and one-half acres of wet, boggy land.

The village voted \$3,000 for sewer purposes last spring, that they might take advantage of the work done by the State and have included some desired improvements. In the plan proposed above, I have considered the village needs and have no doubt but that, should this plan meet your approval, the village will heartily co-operate.

Respectfully submitted,

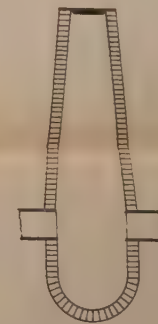
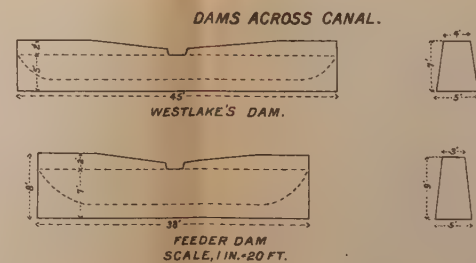
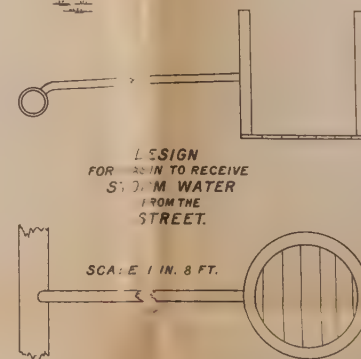
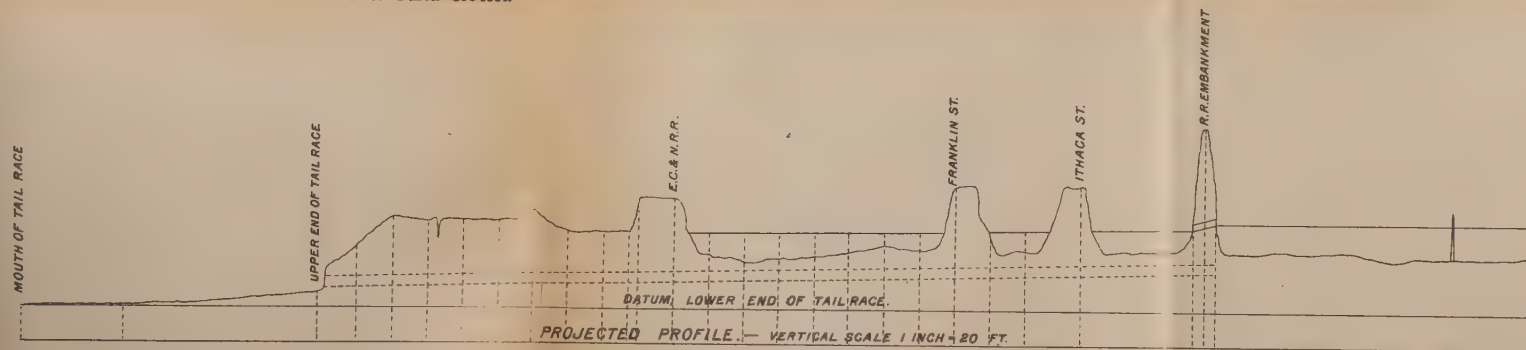
O. S. WILSON,
Civil Engineer.

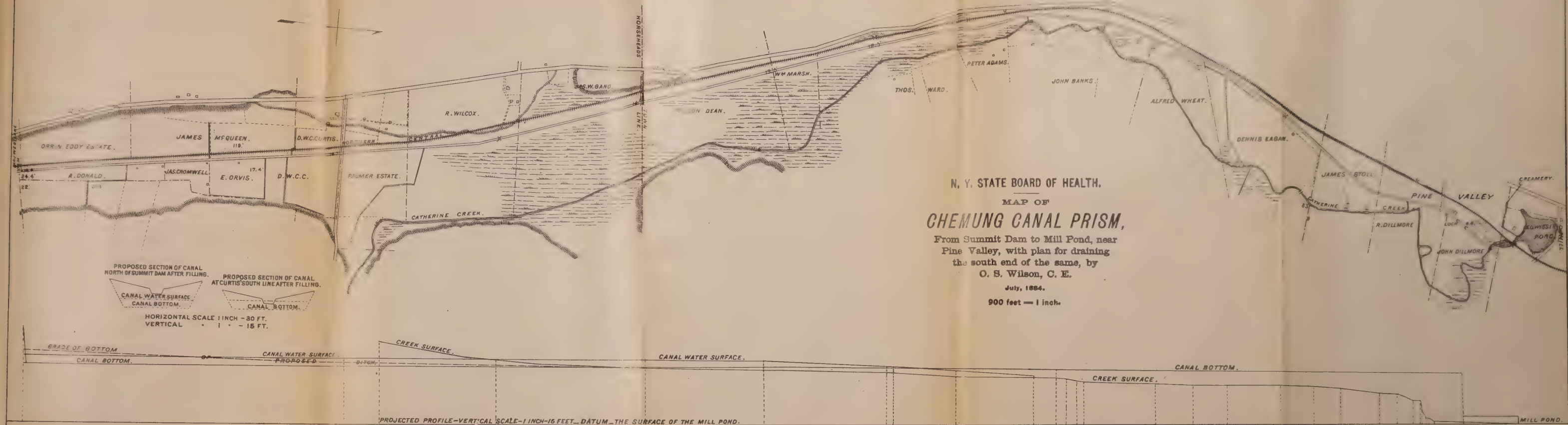




NEW YORK STATE BOARD OF HEALTH.
 Plan for Drainage of Chemung Canal Prism
 IN THE VILLAGE OF HORSEHEADS.

MADE BY
O. S. WILSON, C. E.
 July, 1884.
 Scale—1 inch—400 feet.





REPORT OF THE COMMITTEE ON DRAINAGE, SEWERAGE AND TOPOGRAPHY, ON THE SANITARY CONDITION OF HOOSICK FALLS.

Petition having been made to the State Board of Health from Hoosick Falls, for sanitary counsel as to the best means of abating a nuisance caused by using a brook as an open sewer, a sanitary engineer was sent to examine. The following reports show the actual condition found and remedies proposed :

In response to an application of the board of health, a civil engineer, Mr. Horace Andrews was sent to examine a brook passing through the village of Hoosick Falls and used as an open sewer. He was directed to report the facts as to the condition of this brook and his views regarding the best remedy for the evils complained of as resulting from the pollution of the brook with sewage.

Mr. Andrews' report, which is appended, shows that the village of Hoosick Falls has a population of about 6,000 people, which is increasing at the rate of two and one-half per cent per annum ; that a small brook running for half a mile through the most densely populated part of the place is used as the receptacle for the sewage of the sinks and privies of at least sixty houses, besides a school of 300 pupils and a hotel ; that its channel is obstructed with rubbish ; and that in dry seasons the flow of the stream almost entirely ceases, so that at such times the accumulating filth of about 700 persons lies exposed to sight, emitting most offensive stenches.

The accompanying map shows the position of the brook in the village.

The facts stated warrant the conclusion that the use of this brook as an open sewer creates a nuisance which endangers the lives and health of an important part of the population of Hoosick Falls. In fact no part of the village can be considered safe from the indirect effects of such an extended line of accumulated filth. The diseases

bred in the immediate neighborhood of the polluted channel may readily find their way into any part of the town. The emanations from the filth may easily be carried by the wind into three of the principal churches of the place; the Roman Catholic church stands within 150 feet of the stream, the Baptist church, 360 feet from it; the Episcopal church, about 450 feet, the Commercial Hotel, about 100 feet. The virus of filth diseases may probably be carried by the wind over much greater distances than those above given, and persons affected may spread the infection of the disease by personal contact. For those reasons the use of the brook in Hoosick Falls as an open sewer endangers the health of the whole community. We strongly advise the passage and strict enforcement of an ordinance forbidding the drainage of any polluted water or sewage into this channel.

As to what means should be taken to dispose of the sewage which now goes into the brook, we do not consider it advisable to make a plan for the carrying off of this part of the sewage independent of that of the rest of the village.

The present method of obtaining the water supply of the village from wells and disposing of the sewage in cess-pools and privies in a gravelly soil is sure to end sooner or later in the poisoning of the wells and the prevalence of diseases due to this cause.

We advise the citizens of Hoosick Falls to secure at once a plan for the sewerage of the village by what is known as the "separate system." In the separate system the sewers are constructed of a vitrified pipe and carry sewage only. No storm water should be admitted and the sewers should be provided with automatic flush tanks, discharging at least once every twenty-four hours. For most of the sewers in Hoosick Falls six-inch pipe would be amply large and none need be larger than eight inches. The plan should be so devised that it can be executed at once in such parts of the village as are willing to pay for it, and at the same time capable of future development in other districts not now prepared to meet the expense, which may be roughly estimated at about \$1 a running foot for the average of the village. For the details of points respecting the separate system of sewage, its sanitary and economical advantages we refer you to the report by this committee in Malone, Peekskill and other places. The village should also take immediate steps to provide an ample supply of pure water free from all danger of contamination.

Any attempt to make a sewer of the Hoosick Falls brook by covering it will result in a costly sanitary and engineering failure. The plan spoken of by Mr. Andrews, of putting a pipe sewer under the

brook bed, would answer the purpose of disposing of this part of the sewage of the village in a sanitary manner, but we do not recommend its execution unless it shall prove to be a necessary part of a general plan for the sewerage of the whole village. We strongly recommend that the question of the disposal of the village sewage be considered as a whole, and a plan made which will provide for those districts which want sewers immediately, and at the same time be capable of extension and development to meet future requirements.

This plan should be devised in strict accordance with the latest results of sanitary investigation to prevent sewer diseases.

We are confident that in improved health and safety the citizens of Hoosick Falls will be fully repaid for the expense of providing for a supply of pure water and for the rapid removal of all filth from the village.

JAMES T. GARDINER,
Chairman.

JAMES T. GARDINER, Esq., *Chairman of Committee on Drainage,
Sewerage and Topography :*

SIR — The following report relating to a nuisance in the village of Hoosick Falls is respectfully submitted :

The village of Hoosick Falls is situated upon the Hoosick river, at a point where the natural fall of the river, increased by damming until it amounts to about twenty feet, gives a fine water power to the large manufacturing industry established at this place.

This village is the only prominent one in the township of Hoosick, the most north-easterly township of Rensselaer county.

The population of the township, according to the census of 1880, was about 8,000, and the population of the village of Hoosick Falls is at present as great as 6,000, in all probability, and is increasing at the rate of about two and one-half per cent a year.

There is a small brook running through the most densely-settled portion of the village whose condition is the subject of the present appeal on the part of the local board of health. The accompanying sketch of the portion of the village immediately affected by the brook indicates only approximately the present conditions, since many additions have been made to the business portion of the village since the map was made.

From a point a little to the east of Main street to the mouth of the brook, about one-half a mile distant, the drainage from the sinks and privies of at least sixty houses enters the brook. A large school recently erected on Main street discharges the sewage of its three hundred pupils into the brook, and the Commercial Hotel, near the railroad depot, also sends its filth into the same convenient receptacle.

The water-shed of the brook is very limited, and a portion of its small flow is retained by a dam about three-fourths of a mile from the mouth of the brook and led by water pipes to supply certain business blocks near the Hoosick river. In dry seasons the flow of the stream almost entirely ceases, and at such times the accumulating filth of about seven hundred persons lies exposed to sight, and the stench emitted therefrom becomes intolerable. The bed of the stream is also used as a place to dump all kinds of household rubbish, and the naturally small flow is thereby much retarded.

The only remedy attempted at present for this extremely unsanitary condition of affairs is to compel those draining into the brook to construct cess-pools and vaults, such as are in general use throughout the village.

The soil is for the most part of a gravelly nature and quite permeable, and since wells, springs and cisterns are the only water-supply, the alternative of cess-pools and privy-vaults is about as bad a one as could be proposed.

The village is so situated that a good system of sewerage could be easily obtained, and the health of the people thereby promoted; but without interfering with any general plan that may be devised in the future, the nuisance arising from the pollution of the brook in question may be obviated at a moderate expense.

Without discussing at length plans for remedying the evils complained of, that are from their nature impracticable, it may be well to examine some that have been suggested.

The brook is at present open, except at one place, where for several hundred feet it passes through private grounds, and at street crossings. The plan for covering the entire brook would be quite feasible and would prevent the accumulation of much rubbish in its bed, but this most certainly should not be carried out unless sewage could be entirely excluded.

A brick sewer might be built where the brook now runs, but this would require to be of a diameter of four or five feet to accommodate the surface water in spring, and it would be very liable to become foul during the summer months, while its cost would be very great.

The plan that appears the best is to lay a drain pipe in the bed of the brook, to receive sewage only, and to allow the storm water to flow over this drain in its natural channel. The drain pipe could be easily laid during the dry season and a depth of two feet below the bottom would be ample, since the brook remains filled with water in winter and frost would be thus guarded against.

To preserve a nearly uniform grade the excavation would require to be greater in places, but nowhere would much digging be needed. The mouth of the drain could best discharge above the dam, a few lengths of iron water pipe being laid in the shallow water at the mouth of the brook so as to carry the sewage out to the channel of the river.

Precautions should be taken to prevent the displacement of the iron pipe in times of flood.

During spring freshets the water in the river would at times rise six or eight feet above the mouth of the drain, but there would be still sufficient head to allow the drain pipe to be thoroughly flushed. The length of the pipe required would be about 2,600 feet, and the entire fall is about forty-five feet, which might be diminished in times of flood till the average fall was only one in seventy. An eight-inch vitrified pipe with this fall would discharge nearly a million gallons per day, when running full, hence a pipe of this size would accommodate the sewage of three times the number of persons who now use the brook for drainage, even if an ample water supply should largely increase the amount of sewage of each individual.

It would be essential that this drain should be well flushed at intervals of about twelve hours in order that it may be kept quite clean. If a larger-sized pipe should be used the difficulty of flushing would be increased.

A flushing tank containing about 200 gallons of water should be placed at the upper end of the drain. Water for filling this tank can be brought from the pond above the dam, about one-fourth of a mile, by means of a small pipe. The tank would be slowly filled in about twelve hours when the entire contents would be discharged by means of a large syphon in twelve or fifteen seconds. In order that the water from the flushing tank may pour rapidly through the drain, thus washing it out effectually, openings for the admission of air must be made in the drain every 200 feet at least. These openings must be of the full size of the pipe and should be connected with pipes placed near the bank of the stream.

The upper ends of these ventilating pipes must be high enough above the surface to exclude storm and freshet water and the admission of foreign material should be prevented by a grating over their ends.

It is impossible to give a very exact estimate of the cost of this proposed drain without more detailed surveys, but at the request of the local board of health I have made a rough estimate as follows:

2,600 feet of eight-inch vitrified pipe at 20 cents.....	\$520 00
100 feet of eight-inch water pipe	150 00
100 branches for house connections.....	100 00
13 ventilating pipes.....	65 00
Cost of laying and superintendence	650 00
1,000 feet of one-inch water pipe, and laying	350 00
Flushing tank	350 00
	<hr/>
	\$1, 985 00
10 per cent added for surveys and incidental expenses..	198 00
	<hr/>
Total cost estimated.....	<u>\$2, 183 00</u>

It would be well to allow the brook to remain uncovered in order that it may always be open to inspection and thus sewage cannot be surreptitiously introduced into it.

All dumping of rubbish into the bed of the brook should be prevented and adjacent manure heaps should be removed, if the nuisance arising from offensive smells is to be entirely abated.

It is sincerely to be hoped that this village will adopt a general system of drainage at an early date.

The health of the inhabitants would be improved by the entire abolition of the cess-pools and privies which are now poisoning their wells in many places. The necessity of a good water supply is great, and without it any general system of sewerage would be but partially successful.

HORACE ANDREWS, JR., *C. E.*

ALBANY, *July 31, 1884.*

REPORT ON THE DRAINAGE OF SWAMP LAND IN THE TOWNSHIP OF ROCHESTER, ULSTER COUNTY.

The Board's co-operation having been requested in abating a swamp nuisance in Rochester, Ulster county, the results of the examination are given below :

OFFICE OF THE STATE BOARD OF HEALTH, }
ALBANY, N. Y., *July 18, 1884.* }

TO T. O. KEATOR, M. D., *Health Officer of the town of Rochester,
Ulster county :*

DEAR SIR — In response to yours of June 25th, stating that the "town board of health of the town of Rochester, Ulster county, have declared a swamp in the town to be a nuisance, injurious to the public health, and request the coöperation of the State Board to have it drained and to advise as to the most practical way to drain it," the State Board directed the committee on drainage, sewerage and topography to make such examination and to give such advice as seemed necessary in the premises.

Mr. Horace Andrews, an engineer of experience, was sent to examine the ground, and his report to the committee is herewith appended. Mr. Andrews' plan for the drainage of the locality in question is approved by the committee.

To carry it out, it will be necessary that Samuel B. Baker and the adjoining owner on the south coöperate, since outfall for the swamp must be found through the land to the south of Mr. Baker's property. It seems reasonable that the owner upon the south should consent to the digging of the necessary ditch ; but, should he object, you can proceed under the regular Drainage Act (chapter 888 of the Laws of 1869,) which provides for the appointment of a commission by a county judge to carry out any drainage works necessary for the

public health. A copy of this law will be found on page 47 of the manual herewith forwarded.

Very respectfully yours,

JAMES T. GARDINER,

Chairman of the Committee.

JAMES T. GARDINER, Esq., *Chairman of Committee on Drainage, Sewerage and Topography :*

SIR — In accordance with your instructions, I have examined the swamp land situated in the township of Rochester, Ulster county, with reference to the most practical mode of drainage, and herewith submit my report :

The swamp that has been complained of and declared to be a nuisance and detrimental to the public health by the local board of health lies near the southern boundary of the township of Rochester and is entirely on the land of Samuel B. Baker. The former owner of the land adjoining the swamp had, previous to selling the land to Mr. Baker, granted to other parties the right to dig muck from the swamp and the right of way necessary for the purpose. This right to dig muck is now possessed exclusively by Messrs. M. P. Kiff and M. Kortright.

The muck has been removed from the swamp for many years till a shallow pond about four or five feet deep and covering about one and a quarter acres has been formed. There is no natural drainage to this swamp, which has a water-shed of not more than four or five acres, but at some time a small trunk drain existed, which was doubtless intended to drain away the water so that the muck could be readily removed. The drain is now entirely choked up, and its exact location is not known, but it is about where shown on the accompanying sketch. The malarious emanations from this submerged land, covered with decaying vegetation, have been the cause of sickness in the adjoining houses, and the local board of health has now declared this swamp to be a public nuisance

Apparently nearly all of the muck has been removed, but there may be places where more exist ; the owners of the right to dig the muck refuse, however, to relinquish it, although the water at present has for several years entirely prevented them from digging. It is very evident that if the swamp should be drained and new surfaces

of muck exposed, the owners of the right to dig could very easily restore the swamp to its present condition, and they will not agree to refrain from doing so.

The best method of draining the swamp is shown in the sketch accompanying. At the south end of the swamp an open ditch about 160 feet long and six feet deep could be dug through land only a little above the present level of the pond, thus making connection with another and much smaller pond, the surface of which is at very nearly the same level as that of the larger pond.

From a point on the south-west side of the smaller pond a good trunk drain should be placed ; this would need to be about 100 feet long, and it should enter the smaller pond at about six feet below its present level. The size of this drain should be about one foot by one and a half feet, and, if constructed of chestnut or oak timber, it will not need repairs for a number of years. A good grating should be placed at the upper end of the drain. An open ditch of about 150 feet in length will then lead the water across a small marsh to a drain now existing, about eighty-two feet long. At the foot of this drain the land descends rapidly, and the water flows a mile or a little over till it joins the Rondout creek. It is a little doubtful whether the capacity of this existing drain is sufficient for the increased flow that it would be required to bear. If its size is insufficient, a new drain will be required, and it would be more satisfactory if this drain were constructed at the same time that the ditching is done ; it would be well, also, to lower this drain about one and one-half feet, as it does not now seem to drain very well the small swamp for which it was intended.

It will probably be found necessary to clear out a ditch throughout the whole length of the large swamp ; but this will not require much digging. If any holes are found that have been caused by digging muck, to a greater depth than four or five feet, it will probably be much cheaper to fill them up than to incur the extra expense of increasing the depth of the ditches. From all appearances no such holes exist, and those who have dug the muck report that the digging was only to a depth of four or five feet.

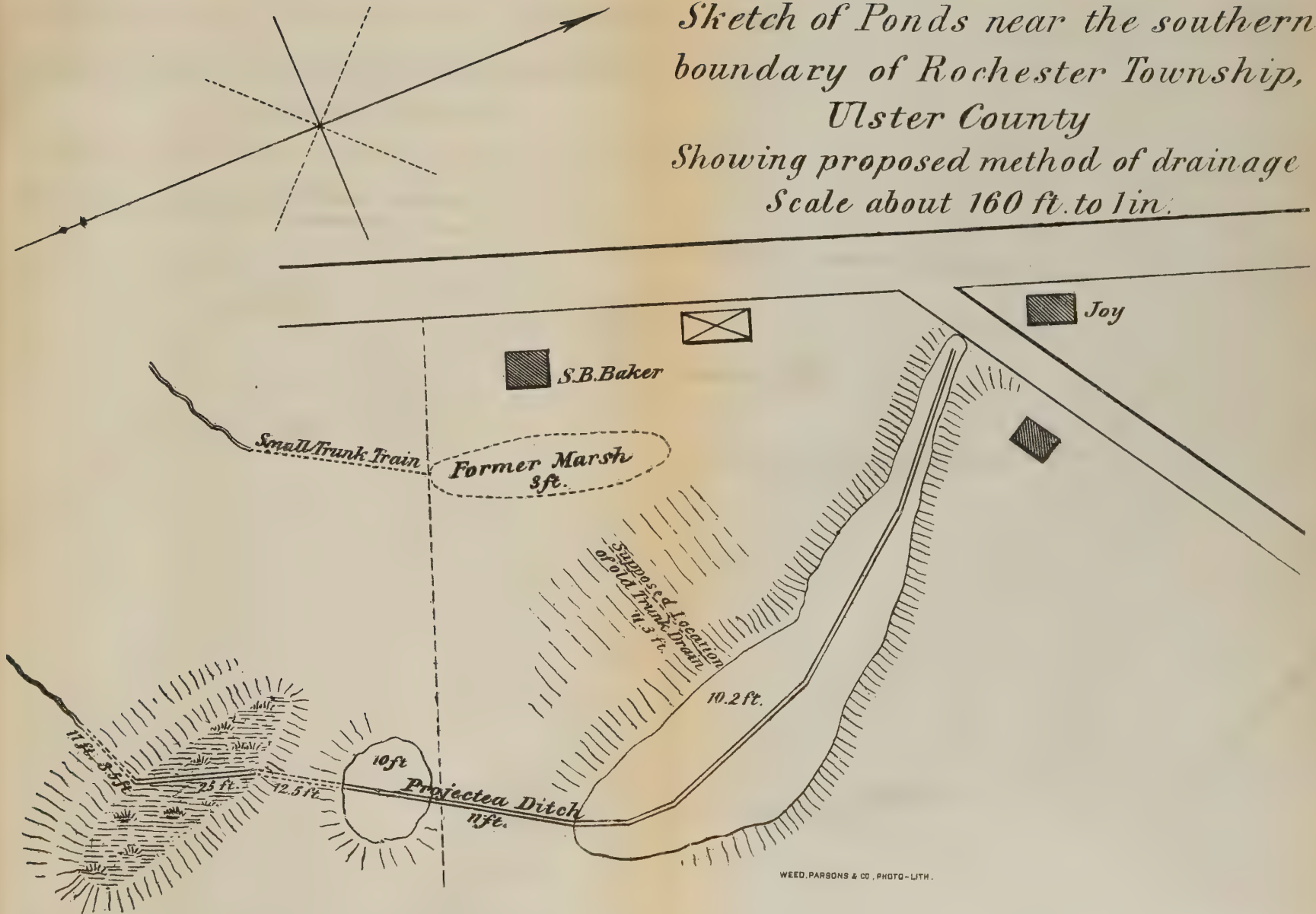
At the rear of Mr. Baker's house, and at a distance of 200 or 300 feet from the large pond, a small swamp existed, which has been drained, and the soil seems to be good and now bears well, though it is probably the same as that formerly existing where the large pond now is.

It is reasonable to suppose that good land would be formed by the drainage of the swamp or pond under discussion if the muck that still remains should be left. If this should be the case, the value of the land reclaimed would repay the cost of drainage to a great extent.

HORACE ANDREWS, JR., *C. E.*

ALBANY, *July* 5, 1884.

*Sketch of Ponds near the southern
boundary of Rochester Township,
Ulster County
Showing proposed method of drainage
Scale about 160 ft. to lin.*



REPORT ON THE SANITARY CONDITION OF THE CITY OF OGDENSBURG.

To his Honor the Mayor, to the Common Council and the Board of Health of the city of Ogdensburg :

In response to a request of his honor the mayor, Mr. W. L. Proctor, I have the honor to make a statement to you of the results of a sanitary examination of the condition of your city made on the 11th and 12th of December. At a meeting of the common council, the boards of health and some of your prominent citizens on the evening of the 12th inst., the results of my observations were briefly stated, so that to many of you the matter will not be entirely new which is contained in the following report :

The city of Ogdensburg, situated at the junction of the Oswegatchie river with the St. Lawrence, on a plateau from twenty-five to forty feet above the St. Lawrence, with comparatively little lowland along the banks of the streams, occupies a site which may be so thoroughly drained as to make it one of the most healthy cities in the State. Indeed, that portion of the city, where sewers have already been built gives evidence of being exceptional in its good sanitary record. This central portion of the city, where your wealthier citizens reside, is with reason considered most attractive and salubrious. It has a system of sewerage planned in 1871 by Colonel George E. Waring, and has an ample supply of water from the Oswegatchie river. While this central and wealthier portion of Ogdensburg is the part of the city which gives to it its character, and which rises before the minds of citizens or strangers when Ogdensburg is spoken of, there is another part of the city, and unfortunately a large part, where the conditions are quite different. The district occupied by the wealthier people seems to include not over a quarter of the inhabited area of the city. It is surrounded by a very large tract occupied by laboring people of comparatively small means. Many of them are French Canadians. The houses in these districts are principally one, and one and one-half story

wooden buildings, many of them very small. Through these districts there is neither sewerage nor drainage, and the people generally are drinking well water. All the filth from the dwellings goes into privy-vaults or on to the ground, and all the kitchen refuse, slop water, laundry water, and other forms of sewage, are generally thrown upon the ground near the back doors of the houses. It is from such districts that danger to the public health arises, and it was to them, therefore, that my principal attention was turned in the recent examination. I inspected the district lying on the west of the Oswegatchie as far south as the French cemetery, then examined the part of the city lying along the eastern bank of the Oswegatchie including the cemeteries, then the districts lying near Canton road, South street, Fayette and Patterson streets, and lastly the districts between Patterson street and the eastern boundary of the city. I was accompanied by Dr. Sherman, Dr. Bartholomew, the health officer, and Mr. Earl, superintendent of the poor, and to these gentlemen I am indebted for much information. They were able to point out to me most of the houses where diphtheria has occurred in the recent epidemic, and where typhoid fever and malarial and diarrhoeal difficulties have been more or less constantly recurrent. All of these districts that I have mentioned as lying around and outside of the central portion of the city are characterized by the same features, namely: an almost complete saturation of the soil during many months of the year, a pollution of the soil and ground water with all the filth produced by thousands of people; and by the use of water from wells, all of which are so located as to be undoubtedly more or less contaminated with the filth of the soil. At the time of my visit the water in the wells was seldom found more than three or four feet below the surface of the ground and was often within one foot. This condition of the ground water is caused by the geological structure which underlies the city. Upon the nearly horizontal silicious limestones, which lie at no great depth, there is superimposed a clay formation impervious to water. This is overlaid with a light sandy loam from four to six feet deep, and possibly in some places it may be ten feet. It was difficult to get exact data in the matter. All about Ogdensburg the lands are higher and the ground water from these districts runs down under Ogdensburg, saturating the loose soil which lies above the clay. The water soon fills the soil and takes into solution the filth from the surface of the ground and from the privy-vaults and cess-pools so that all the undrained part of

the city is underlaid by a stratum of water in which is dissolved the filth produced by the inhabitants of these districts. The wells are mere holes dug down into this stratum of polluted ground water. It must not be considered that the soil is a barrier to the flow of water. The ground water which underlies Ogdensburg is moving with currents through the ground toward the banks of the two rivers, where it finds outlet in a moist or springy line above the clay. This line of discharge of the ground water may be readily observed above the water-works on the west side of the Oswegatchie. Lest your citizens should think that I exaggerate the condition — the extent of the pollution of the ground water — I would say that I examined several hundred back yards during the course of my visit, measured the depth to the water surface in the wells, and examined the methods of disposal of the filth from the dwellings. These houses were not selected for me by the health officer as unusually bad specimens, but they were chosen by myself, and I often went from yard to yard through a whole block. I was in this way able to form a judgment as to the habit of the people, which undoubtedly is to throw their filth into their yards, where it decays, part passing into the air and a part into the soil to contaminate the soil and the ground water. In the district lying west of the Oswegatchie, in the unsewered parts, I found the ground water from three to four feet below the surface. The same is true of the ground water along Mechanic street and Congress street east of the river. In fact nowhere from the river to Patterson street, and south of Jay street, did I find the ground water lower than three feet from the surface except close to a sewer. Through the low district of Canton street, South street, and what is known as Pious hollow, I found the ground water absolutely at the surface of the ground and standing upon it. The water which is there seen in pools and ponds is not surface water properly speaking, but is ground water rising above the surface. Almost everywhere in these districts I find people drinking well water. After careful inquiry from five physicians I could only learn of two cases of diphtheria occurring where the people drink city water. I found in a number of places people who had the city water for ordinary house use were drinking well water, which they said they preferred to that of the Oswegatchie. Among a very large number of people through all grades of society in Ogdensburg, there appears to be a feeling unfavorable to the city water, which arises apparently from an uncertainty as to its purity and wholesomeness. It is evident that the

ground water of the city of Ogdensburg must be much more seriously contaminated than the river can possibly be. But, since this feeling exists against the city water, I made an examination of the present supply from the Oswegatchie. I find that it is taken from above the dam nearly opposite the center of the city. Theoretically it is taken from a point somewhat higher up than this, as a wooden box leads from the water-works up to a point nearly opposite Gates street. But this wooden box is described as being in such a condition that, if the end of it were stopped up, water would flow in through its whole length. From a sanitary point of view it makes very little difference whether the water is taken directly above the dam, or a thousand feet higher up. The banks of the river for a long distance above the water-works are lined with the houses of the very poorest part of the population, whose pig-sties and privies stand along the shore as thickly as they can be placed. All the surface drainage and polluted ground water of large districts is entering the stream above the intake of the city water. In time of low water, when the filth is not greatly diluted, it is certainly a menace to the health of the city. These districts which line the river above the point where the city water is taken are the very ones where epidemics and zymotic diseases are most likely to occur. Moreover, just above the city limits there is a very large cemetery, or rather three cemeteries, lying immediately on the right bank of the river, and having nearly 3,000 feet of frontage on the stream; while on the west side of the Oswegatchie lies the French cemetery, which is drained by a small creek running into the river within half a mile of the inlet of the city water. In examining these cemeteries I find that the ground water rises to within three feet of the surface of the ground. To prevent such saturation of the soil, ditches six feet deep have been dug in the cemeteries on the east side of the river, and the ground water is running from these ditches. In spite, however, of the ditches, the ground water in the areas between them rises to within three feet of the surface. This means that the products of the decomposition of the bodies and all the swarms of bacterial life, which are known to inhabit the soils of cemeteries, pass into the ground water, and by the flow of the ground water to the river they are carried into the stream. In these cemeteries, as in the city of Ogdensburg, an impervious stratum of clay lies not far from the surface. The ground waters cannot penetrate it. They flow along it toward the river bank, discharging along a wet line which is readily seen. There are thou-

sands of graves in these cemeteries. The cemeteries are already so crowded that it is proposed to extend one of them along the river bank toward the city. The soils of crowded burial grounds have no power to purify ground waters flowing through them, but on the contrary they saturate these waters with the products of the decomposition of the bodies, and with the living organisms which accompany putrefaction. Should there be a serious outbreak of cholera during the coming season, and should the bodies of the victims be buried near the bank of the river, no one could say that the specific poison of cholera would not be carried into the Oswegatchie by the flow of the ground water through the cemetery. The inclemency of the season did not allow of my examining the head waters of the Oswegatchie, so that I have no means of determining whether the conditions about the heads of the stream are likely to affect the wholesomeness of the water.

The examination of the banks of the stream for a mile above the present intake showed that there is grave danger of the contamination of the water from drainage into it of the polluted ground waters of a thickly-settled part of the town and of the cemeteries beyond. The rain current of the river sweeps close to the shore along the cemetery front and then swings from there toward the westerly side of the river. This was well observed on the day of my visit, as a line of drift-wood was following the main channel. Whatever flows into the channel opposite the cemetery becomes thoroughly mixed with the waters of the river by the time it reaches the intake of the city water. As regards the district lying on the east side of your city beyond Patterson street, I found there the same conditions that exist elsewhere, namely: Ground water arising in the wells to the surface, filth disposed of in the soil and on the soil of the back yards, and the general drinking of well water. In one house where typhoid fever has constantly occurred, I found a wet cellar and a privy just outside. There can be no reasonable doubt that the filth of the privy dissolved in the ground water was passing into the cellar. In fact, I believe that to be the case in many of the cellars that I visited. The unwholesome features which I have noted in the outlying districts of your city are so similar that it is not necessary to speak of the different streets in detail, but it may be well briefly to state two well-known effects of such conditions on the public health, remembering that the difficulties spring from saturated soil and from polluted ground waters.

SATURATED SOILS.

The saturation of soils under human dwellings is known to produce most serious bad effects upon health. It is now well proven that no other cause acts so efficiently to produce consumption as living upon saturated soil. This has been demonstrated not only by the work of Dr. Bowditch in Massachusetts, but in England where towns were suffering from soil saturation and had neither sewerage nor drainage, when sewerage was introduced the disease which most largely disappeared was consumption. With the introduction of thorough subsoil drainage the death-rate from consumption in Salisbury, England, fell forty-nine per cent; in Ely, forty-seven; in Rugby, forty-three; in Banbury, forty-one per cent. But, on the other hand, in towns which had been sewered with impervious pipe and the subsoil not drained, there was no such reduction in the death-rate from phthisis. The connection of malarial diseases with soil saturation is well known. Rheumatism and bronchial affections may also be expected on such soils. Through large tracts of your city the soil about the houses is saturated and the cellars are damp or contain standing water. Such a condition of itself is very prejudicial to the health of the people, but when to this evil is added that of

POLLUTED GROUND WATER

the evil becomes much more serious, especially if the people are drinking this water. Excremental and other filth and the living organisms which attend upon putrefaction enter into the system through the drinking water, and they reach it also through the air which rises from cellars into the dwellings; for the pollution of the ground water pollutes the air that rises from the ground. A loose soil like that of Ogdensburg contains about thirty per cent of air, which moves through the ground with more or less freedom. Every heated house is a chimney sucking the air up from the ground beneath it and bringing with the air whatever contamination the air currents are loaded with. If the ground under the cellars and around the dwellings is saturated with polluted water, the air which arises through the houses from the cellar is all polluted. In winter when the windows are closed it becomes a most fruitful source of disease. Your people are, therefore, drinking polluted water and breathing tainted air as well as air loaded with soil moisture. Moisture of itself is bad enough and filth is bad enough, but moisture and filth together make the most

prolific sources of zymotic diseases, and all diseases become more malignant under such conditions. The evil too is one that rapidly increases. As the poison or germs of specific diseases become implanted in the polluted soil, diphtheria, typhoid fever and diarrhoeal diseases will become more and more common, and the way is made easy for severe epidemics of cholera, diphtheria and other deadly maladies, while consumption and malaria must be expected to increase year by year. A study of the distribution of diphtheria and cholera has proved beyond question that they are closely associated with filth. But diphtheria is also contagious as are a number of the other diseases which are promoted by the presence of filth. We rightly live in fear of cholera and of typhoid fever, but we must not forget that diphtheria annually kills many more people than typhoid fever, and that it is really in this country the most deadly of the filth diseases.

REMEDY.

Fortunately the remedy for these unsanitary conditions, which exist in large parts of Ogdensburg, is comparatively simple. The topographical situation, as I have said, makes the drainage of every part of the city easy. In that portion of the city where sewers have been built I find that the ground water has been lowered so that its surface was six or seven feet below the ground at the time of my visit. The remedy, therefore, for the saturation of the soil in the remainder of the city is that which has been already partially applied, except that the drainage would be more efficient if sub soil drains were laid with the sewers. If sewers of vitrified pipe are properly laid they are impervious to water; and while they carry off the sewage which is thrown into them expeditiously and efficiently to their outlet, they do not take in the water of the soil through which they pass. It appears from what I have said of the saturation of your soil that drainage is as much needed as sewerage. This can be accomplished by laying in the same trench with the sewers a system of drains similar to those used in agricultural drainage. The sub-soil drains should have an outlet independent of that of the sewers so that no sewer gases can enter them. These drains should not only be laid in the street with the main line of the sewer, but branches should be carried up to every house so as to secure the drainage of the soil about the dwellings. Where this is done it will be necessary to lay drain pipe on both sides of the sewer so as to make connection with the houses easy. With a proper system of

pipe sewers, a plan of which has already been made by Colonel Waring, and with such sub-soil drains as I have described, the saturation of the soil would be completely remedied, and the further pollution of the ground would be prevented if by a thorough system of sanitary ordinances and inspection the people were compelled to use the sewers. It must, however, be remembered that a great deal of the vegetable and organic filth coming from the dwellings is material too large to be thrown into sewers. It is this which constitutes the garbage proper of a city. Provision should be made by the city of Ogdensburg for the removal of the garbage from the vicinity of the dwellings. Instead of throwing out into their back yards all the cabbage stumps, bones and vegetable and animal refuse from the houses, people should be compelled to put their garbage in pails, and these pails should be removed at the expense of the city, the contents being disposed of in some safe place. No city has been successful in carrying away in sewers all the filth in the city. Garbage carts and sewers both are necessary to carry off the filth in thickly-settled places. The city water-works must of course be extended into all the regions where sewers are built because the sewers will depend for their working upon the supply of water from the city works. Sewerage means water carriage, and without a water supply the sewers would be useless. But even after all of these precautions have been taken no well water in the city of Ogdensburg will be safe for drinking. The whole soil has become so polluted that the well water will always be contaminated. Privies, cess-pools and wells in thickly populated districts are all dangerous to the public health. When, therefore, your city has provided sewers, garbage carts and water supply for the whole city, I recommend that the privies be cleaned out and filled up and that the wells also be filled.

Cleanliness which is essential to the health of a city cannot, however, be secured merely by making laws. It is of importance that the sanitary regulations of your city be enforced by constant inspection. Your health officer or your inspector should be kept constantly on duty examining premises through all those regions where the citizens are too unintelligent, too ignorant, or too careless to appreciate the importance of cleanliness. You have, perhaps, an unusually large population requiring this constant supervision. From my observations of their habits I am convinced that unusual precautions will be necessary to secure the anticipated benefits from a thorough system of sewerage.

WATER SUPPLY.

If the people of the whole city are to be compelled to drink the city water every effort should be made to render its purity beyond question. So far as contamination from the city or the cemeteries is concerned the purity of the water can be secured by taking it from above the cemeteries. It has been suggested that if Colonel Waring's plan for the sewerage of the district lying between Jersey avenue and Gilbert street was carried out and the outfall of this sewer was carried along Water street to the tail-race under the dam, that this would prevent the contamination of the water by the sewage of that portion of the city. It would be a partial remedy, but owing to the condition of the ground water and the contamination of the soil which I have described, I think it would be impossible to prevent the constant discharge of the ground water into the river. Moreover, the contamination from the graves cannot be remedied by any system of drainage of the cemeteries. The proper remedy would be to lay a pipe in the bank of the river to a point above possible contamination from these sources.

Respecting the amount of water used by your citizens it should be remembered that probably only about half of the people are using city water. You have an estimated population of more than ten thousand people, which probably represents about two thousand families. There are a little over eleven hundred taps on the pipes of the water-works. As a number of these are business places it is quite probable that about one-half of the people only are using city water. The average amount pumped is now nearly a million of gallons a day. When, therefore, the whole city is supplied it must be expected that double the present amount will have to be pumped. Although this would provide for a consumption of nearly two hundred gallons per head per diem there is little probability that the people can be made more economical in the use of water. The history of all other places in America is that the consumption per head increases rather than diminishes. At any rate in view of the fact that with only one-half of the city supplied with water the average daily consumption was 947,943 gallons during the official year of 1883-84, it would be unwise to assume that less than two million gallons will be required in the near future, should the contemplated sanitary improvements be carried out.

OUTFALL OF THE SEWERS.

Whatever the change in the in-take of the city water, the sewers of the district on the east side of the river should be carried along

Water street and discharge into the tail-race; for, if discharged above the dam, the sewage would be deposited on the banks of the river on account of the sluggishness of the current, and in summer when the sewage flats thus formed were exposed they would endanger the health of that part of the city. There is not sufficient current above the dam to carry sewage away. As regards the outfall of the sewers in the southern part of the city, it would appear that the plan of Colonel Waring might perhaps be improved by building a sewer down Barry street to the St. Lawrence, carrying in this sewer the water from the large drainage areas which lie to the south and east of this part of the city. These drainage areas send down, I am told, large bodies of water in the spring. Certainly the ground in the neighborhood of the corner of Knox and Barry streets and through the district on the south is very thoroughly saturated at present. To give these waters a direct outlet down Barry street to the St. Lawrence, would prevent the necessity of building the large sewer down Knox street to Tate street.

As regards the outfall of the Tate street sewer, it should be made at some point where the current is strong enough to carry the sewage away and should not terminate at any eddy or still water.

DANGERS AND DUTY OF THE CITY.

It was evident from an inspection of the unsewered parts of your city, that many of the residents of these quarters have neither the means nor the knowledge which are necessary to execute the sanitary works absolutely needful to the wholesomeness of these districts. The works of drainage and sewerage that I have described must either be largely carried out by the help of the city or they will not be done at all. In many of the streets the property is of so little value that a large assessment would amount to practical confiscation. The health of the people covering this large portion of the city which I have described is of serious moment not only to themselves but to the whole community. If the accumulations of filth and the pollution of the ground are allowed to exist and to increase, they furnish, as I have said, the very conditions which will foster outbreaks of serious epidemics of contagious diseases. If such diseases gain a foothold in the suburbs of the city they are liable to be spread in many ways throughout the whole community; so that one need have no hesitation in saying that the safety of the whole city depends upon the cleanliness of those large districts which immediately surround the wealthier part of the town. Each citizen is interested,

deeply interested, in seeing that before the cholera comes to this country the whole city is thoroughly cleansed. The fact that while the recent severe epidemic of diphtheria found its main foothold where people were poisoned with filth, but yet was easily carried throughout the city by contact of person with person, should be proof enough of the interest which the whole community has in the healthfulness of every part of the city. It seems, therefore, that self-interest as well as the dictates of a wise philanthropy should prompt the citizens of Ogdensburg to take active measures for the execution of the needed sanitary reform.

Very respectfully,

JAMES T. GARDINER,

Chairman of the Committee on Sewerage, Drainage and Topography, State Board of Health.

At a special meeting of the State Board of Health, held at Albany, December 17, 1884, the above report of Director James T. Gardiner was presented and approved by unanimous vote.

ALFRED L. CARROLL, M. D.,

Secretary.

THE SANITARY CONDITION OF PORT BYRON, N. Y.

Complaint having been made of a nuisance existing at Port Byron, caused by the malarious condition of a mill pond, a sanitary engineer was sent to examine and report. His report together with some correspondence pertinent to the subject is here given :

JAMES T. GARDINER, Esq., *Chairman of the Committee on Drainage, Sewerage and Topography of the New York State Board of Health:*

SIR—On September 17, I visited Port Byron to investigate the nuisance complained of by Mr. John Hayden, and report as follows:

Owasco creek, the outlet of Owasco lake, has considerable fall, which is utilized as a power at various places between the lake and the dam near Mr. Hayden. A good many years ago there was a mill at Port Byron, the mill-race extending up to the dam.

The State took and paid for this race and dam as well as the privilege of drawing off a certain amount of water to supply the canal, with the understanding that Mr. Hayden and the mill-owners below could have the use of the surplus water; said mill-owners still avail themselves of this privilege.

During the dry weather the water being low, the gates of the mills above are shut at night, holding the water back until the ponds are full.

When the mills start in the morning the water flows on down the creek. As a result the flow of water in the creek near Mr. Hayden's is spasmodic.

From about 9 or 11 P. M. till 1 P. M. the next day there is little water coming down, and what there is is taken by the State. At about 1 P. M., the water rises suddenly, flowing over the dam and enabling these lower mills to start and run as long as there is sufficient head

or until the water in the ponds is drawn so low as to leave the mud banks, that have formed during the past fifty years or more, uncovered. As a result, from midnight till noon the conditions are favorable for malaria. The bottom of Mr. Hayden's pond is nearly full of silt and vegetation in all stages of decay.

The Hayden woolen mill is now owned by Ezra Hayden, Esq., brother of the complainant. The floor and waste-ways are now so badly out of repair that it is impossible to hold the pond full of water. There are few, if any, residents in the immediate vicinity except members of the Hayden family, and they should realize the importance of putting the mill and pond in a better sanitary condition. I would respectfully suggest the following to accomplish that end:

1. Give the pond a thorough cleaning, the material removed to be carted off on the land and not into the creek to be washed down to the pond below.

2. Repair the waste-ways and floor to prevent leakage.

3. Put a tidal gate just below the State gate-house.

4. Stop running at night in time to leave the pond full of water.

By carrying out these suggestions the health of that immediate neighborhood will be very materially improved.

It is my judgment that the State is in no way liable for the unhealthy condition of the creek at this point.

Respectfully submitted,

O. S. WILSON, *C. E.*

October 1, 1884.

PORT BYRON, *September 30, 1884.*

To the President State Board of Health, Albany, N. Y.:

DEAR SIR — You have perhaps seen the maps that cover the grounds of the Owasco valley at this place, and can understand the matter better than from my explanation.

Mr. Wilson undoubtedly understands that my brother owns the water power, and I the two residences above the pond. I do not wish you to think that this matter is all the fault of the men who now have authority over canal matters, as my brother may also be at fault.

Since B. S. W. Clark took the management of the canals, the slash boards have never been put on the dam, which I have frequently sought to have done, as the water rights entitle this dam to one foot more water.

In my letter to the State Board of Health, I stated that *I would be at the entire expense* (or rather that I had repeatedly made the offer to the canal men) under *their supervision*, to fix the dam here so as to entirely do away with the nuisance of which I complain, and that if the work *in any way* was detrimental to the interest of the State to *immediately remove it*. My proposition did not even enlist their attention.

The plan is simply to *fill the ponds full and not draw the water to the mud*. This would give the State a reservoir of nearly three times the reserve they now have. This plan would place my brother under the necessity of submitting to have a water level placed across his race near his mill, so the State would get their share, and so that there would be no cause for suspicion. Understand that I am not trying to get any more water — I am only seeking to have a fearful wrong remedied.

We know our duty, or have always gracefully submitted to the rights ahead of us, so that we defy the canal authorities to prove that we have taken any water only by their instructions, and as for myself, and in fact for all of us that have to suffer this terrible curse, I am at a loss to know why it is so relentlessly placed upon us, as I flatter myself that we are as kind-hearted a people as can be found, and place a high estimate upon the golden rule and follow its teachings as well as we can. Last week a lady had occasion to walk past our pond, and the moment she received one breath from its deadly stench she sickened and vomiting set in and she scarcely had strength to drag herself away. To this fact the lady will testify if required, so that I may send it to you. I simply state this to show the condition of the air we have to breathe. We would go away from our homes, but all the property we have is in them, and from the unnecessary and malicious treatment we have been compelled to endure, our property has become nearly worthless.

If Mr. Wilson has any doubts as to our statements we will be very prompt in making them clear to him. I think that he understands the matter, so that there may be some action taken in the matter soon.

I am of the opinion could either engineer Richmond or Whitford, or the division superintendent, come here and study the matter, it could be all pleasantly arranged.

I ask your pardon a thousand times for making you this trouble, but the case is a desperate one, and prompt action is our prayer that you may grant.

Very truly yours,

JOHN HAYDEN.

PORT BYRON, N. Y., *November 30, 1884.*

To the State Board of Health, Albany, N. Y.:

GENTLEMEN — Some months ago I made a statement to you regarding the condition of the mill-pond near my house. Mr. O. S. Wilson soon appeared and promised to remain with us until we were relieved. His stay was very brief. He left very soon and we have heard nothing from him or the Board of Health since.

To more fully substantiate my statement I send you the inclosed. This pond is on the Owasco outlet, which flows through Port Byron and Auburn and is located between the two places. When the cholera visited the United States several years ago a number of persons died with it in each place, and it is not impossible that the epidemic was invited by the condition which I ask you to help us out of. There is poison enough coming up from the uncovered mud from this pond alone to require prompt and decided attention. Aside from the air being saturated by decaying vegetation every twenty-four hours, there must be 100 pounds of little fish and water insects that are left on the mud that die and decompose and send off a terrible stench, with other poisons.

Not hearing from you I wrote to Mr. Shanahan asking him to come and look the matter over. He pays no attention to us whatever. I asked to be allowed to remedy the matter at my own expense and cannot get the privilege.

Our treatment in the matter is considered by people here who understand the matter as simply an outrage; that is, the treatment by the canal authorities. Trusting you will pardon me for troubling you again.

Very truly yours,

JOHN HAYDEN.

STATE OF NEW YORK, }
County of Cayuga, } ss.:

G. W. Latham and Wm. B. Hoff, being duly sworn, depose and say, and each for himself deposes and says, that he resides in Port Byron in said county, contiguous to the Hayden mill-pond, which is a feeder for the Erie canal at Port Byron; that during the months of October and November, 1884, he has frequently had occasion to pass by said mill-pond on the highway leading to Auburn, and discovered that the water was on every occasion nearly all drawn from said mill-pond, leaving the mud exposed to the action of the elements, thus filling the air with malaria, the odor arising from the

mud thus exposed being very offensive and at times almost stifling, and in the opinion of deponents very injurious to the public health.

G. W. LATHAM.

Subscribed and sworn to, this 20th day }
of November, 1884, before me. }

HOWELL B. CONVERSE,
Justice of the Peace.

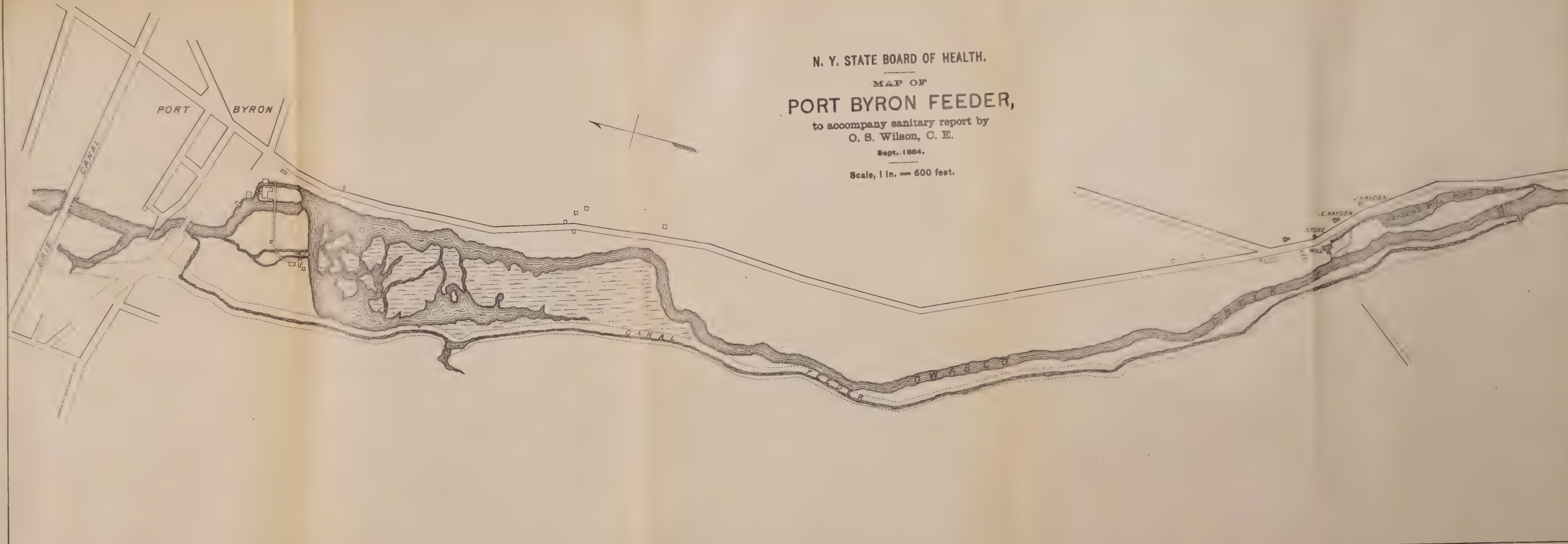
The undersigned members of the board of health of the town of Mentz, Cayuga county, are fully satisfied of the truth of the allegations embraced in the within affidavit.

JAMES V. WHITE, *Supervisor,*
AUGUSTUS KELLY, *Town Clerk,*
H. B. CONVERSE, *Justice,*
C. R. ALDRICH.

Board of Health, Town of Mentz.

The undersigned member of board of health of the village of Port Byron is fully satisfied of the allegations embraced in the within affidavit.

A. D. STEWART, *M. D.,*
Board of Health, Village of Port Byron.



N. Y. STATE BOARD OF HEALTH.

MAP OF

PORT BYRON FEEDER,

to accompany sanitary report by
O. S. Wilson, C. E.

Sept., 1884.

Scale, 1 in. = 600 feet.

REPORT ON SANITARY CONDITION OF SYRACUSE.

To the Board of Health of Syracuse :

In response to the resolution of your board requesting me to make to you a formal statement of the result of my sanitary inspection of Syracuse I beg leave to make the following report :

I visited Syracuse on the 3d of December at the request of your board to examine the present method of sewage disposal by the discharge of the sewage of the city into Onondaga creek, with the view of determining, if possible, whether the pollution of this creek with sewage is likely to prove harmful to the health of the city ; and if such should seem to be the case, to suggest some effective remedy. In connection with this inspection I was requested to examine hastily the present source of water supply.

In company with Dr. Mercer of your board and Inspector Pollman, I examined Onondaga creek from Belden avenue southward into the village of Danforth for some distance above the water-works.

Your city is now said to have a population of some 65,000 people, the greater part of whom live on the west side of Onondaga creek. To the west of the creek the population has increased rapidly and must already be quite large, so that Onondaga creek, which formerly nearly skirted Syracuse upon the west, now runs through the populated part of the city for a mile and a half. The land on both sides slopes down to the creek with such rapid fall as to make the channel of this stream the natural receptacle for all drainage. Hence it is that as one sewer after another has been built they have found natural outlet into this stream, whose bed is from forty to sixty feet broad, and whose volume at low water is said to have been equivalent to a flow of over 16,000,000 gallons per diem before the water-works drew off part of the water.

The water-works are now pumping about 5,000,000 gallons a day into the city. In the dry season of the year the greater part of

this, often the whole of it, comes from Onondaga creek, so that the late summer and autumn flow of the stream has already been lessened from twenty-five to thirty per cent.

The use of water in your city has very rapidly increased within the past five years. It is the opinion of those who have observed the matter that the number of water-closets has probably doubled within the past five years; but so many houses are still unsupplied that it is thought that the increase in the number of water-closets in the next ten years will cause fully double the amount of sewage to enter the sewers that is now discharged into them.

Until the sewers were generally used for carrying off sewage from the dwellings a comparatively small amount of filth was brought down into Onondaga creek, but now the amount is steadily increasing, while the water in the dry season must decrease year by year, owing to the increasing amount taken by the water-works.

In examining the banks of the creek on December 9, I observed that so much sewage is even now poured into the stream that deposits of filth are forming on its banks and in its channel. The creek has a fall of a little less than one foot in a thousand through the city. This slight fall causes a sluggish current, and the volume of the stream is so greatly reduced in summer and autumn that the slow current is incapable of carrying away the greater part of the solids that come down with the sewage. They are therefore deposited on the bottom and along the shores of the creek. Several causes are acting to make the creek fluctuate, and this rise and fall of the water tends to alternately spread the sewage over the banks and shallows of the stream, and then with the subsidence of the water, to expose it to the action of the sun and air.

On the day of my visit I found that there was a margin from one to four feet wide of a black putrefying organic substance exposed along the sides of the creek, and that by some recent rise in the stream this had been wet and then afterward exposed to the air. This accumulation of sewage along the creek is not always apparent until the thin film of mud which covers and masks it is scraped away. It will at once be recognized by any citizen who desires to investigate for himself by the inky blackness of the material.

These foul accumulations are to be found as far south as Adams street; but they increase in quantity in coming northward through the city. One of the worst places is north of the breweries near the New York Central railroad. Even under water these foul masses of organic matter are undergoing rapid decomposition, and the sur-

face of the stream is broken by bubbles of gas liberated by the process of putrefaction.

Many of the sewers are emptying into the creek a little above the water surface so that the sewer mouths are exposed to the air. At Adams street a factory stands close to the bank near the sewer mouth, and the owners complain of intolerable stench when the wind is from the north or north-west in warm weather.

The smell complained of at this point is doubtless from the sewer itself and not from the creek; but it would not be practicable to give this sewer an underwater exit into the creek that could be relied upon to permanently resist the floods and ice of spring without a large expenditure. At Belden avenue I found a High school and another large school situated close to the banks of the stream and here the bed of the channel and its sides are most foul. The decided smell noticed at this point is, however, due to the gas waste which is poured into the creek not far above.

While the smells observed on the morning of my visit did not seem to be from the filth in the creek, which was really frozen at the time, these deposits undoubtedly would give off most offensive odors in warm weather, and I have no doubt that the stream itself, owing to the great amount of putrefying material in its waters and in its bed, will become very offensive in hot weather if it has not already become so. The fact is that probably 5,000,000 of gallons of sewage daily are being poured into the Onondaga creek, and the creek itself in time of low water is liable to have a flow of not over 10,000,000 gallons a day.

The whole flow of the creek is thus converted into dilute sewage, and the solid organic matter discharged from the sewers are not carried down to the lake by the sluggish current of the creek but are simply deposited in its channel. Onondaga creek has indeed become a mere open sewer running for a mile and a half through a thickly populated district of the city.

The enormous amount of organic matter thus deposited in the channel fills it and obstructs the waterway so that annual cleaning has already been resorted to at large expense. During the next ten years it may easily be anticipated that these organic deposits will more than double in the quantity accumulated daily. The filth of Syracuse is not being disposed off, but is being piled up in putrefying masses in the channel and on the shores of Onondaga creek, polluting the stream until it is already so impure as to be little better than sewage. These conditions are most dangerous to the health of

the city. Sooner or later filth diseases will become epidemic along the course of the stream and spread into other localities. That some epidemic has not already occurred is probably due to the fact that the evil is of such recent origin; but immunity from the consequences from such accumulation of filth as now exist in Onondaga creek cannot long be expected to continue.

REMEDY.

It has been proposed to wall the creek and arch it, making thus a great closed channel over which buildings could be placed. No plan could be worse than this in its probable consequences to health. An arched channel to carry the enormous floods which come down into Onondaga creek, in which the water rises ten feet, must necessarily be very broad. In time of low water the stream would be very shallow, the current sluggish and shoals of putrefying filth would lie in its course. These shut out from the sun and air would become most active sources of disease, and the contaminated currents of air and gas would find escape into the buildings upon and near the channel. The work would be a very costly one and the channel would very soon fill up with the accumulations of silt and filth from the sewers. It would be impossible to clean these out except at great expense, and the work would prove a very costly sanitary and engineering failure.

Another and more feasible proposition has been to leave the main channel open but to excavate in the middle of it an inner channel having walled sides; the cross section of this channel being such that it would be filled with water in time of low water, while in the time of high water the flood would spread into the larger channel of the present stream bed. This is merely a proposition for an open sewer down the center of the present channel of Onondaga creek. A sewer with walled sides and no top. The sanitary result of this plan would be nearly as bad as that of the plan just mentioned. The sewage in the creek whenever raised by floods would spread over the surrounding channel, and as the water receded into the center waterway between the walls, deposits of filth would be left on the surrounding shores there to breed disease in the heat of summer. The walls too of the central channel would soon cease to be water tight and the ground about would be soaked with sewage. In addition to this, the stream itself would throw off gases and organic matter detrimental to health. The organic matter is thrown off from the surface of a stream of sewage when it is broken either

by the rippling of the wind or by a rise of bubbles of gas from the putrefaction of the organic matter. The air over every such stream may become charged with these exhalations, which, by gentle wind currents, may be carried to dwellings quite a distance from the stream of sewage. Experience has shown beyond question that it is dangerous to health for people to live in the neighborhood of pools or streams of sewage. The emanations from such bodies of water are dangerous beyond question. There is but one safe way of carrying sewage through a populated district, and this is in a closed conduit or pipe so smooth and so thoroughly flushed that none of the matter carried in suspension shall be deposited and decomposed.

For this reason I consider that the only method of disposing of the sewage of Syracuse is to build an intercepting sewer on each side of Onondaga creek into which all the city sewers shall empty. Such intercepting sewer should be constructed with a view of being extended to the southward far enough to take the sewage from the farthest southern limit of Syracuse in its future developments. Already the village of Danforth has grown so as to be practically a southern extension of Syracuse on the south, and there are some 1,500 people in the village. Soon sewers must be built there, and unless out-fall is found for them through the sewers of Syracuse, the sewage will be turned into the creek greatly to the detriment of the health of the city. It is therefore wise to so plan the outfall sewers of Syracuse that they may furnish the outlet for all the sewage of the population immediately to the south. The problem is not a difficult one. The first intercepting sewer needed is the one on the east side of Onondaga creek. Outfall for it can be found in Onondaga creek below Belden avenue, where the fall and volume of Onondaga creek are so great that the sewage discharged into it will be carried down into Onondaga lake, or deposited so far from dwellings that little harm will result. If the salt flats should ever be populated it would only be necessary to extend the intercepting sewer northward to the lake one and one-half miles. The intercepting sewer should probably go as directly as possible from Belden avenue bridge to Franklin street near the canal. The exact route could only be determined by a careful survey ; but it is extremely important that this sewer should have no sharp bends and be unusually straight in order to carry as large a volume of water as possible. Any bend in the sewer between the canal and Belden avenue should be curves of

large radii, or the flow of the whole sewer would be checked. From the canal the sewer may be straight along Franklin street to the armory, and then passing under the armory be continued along Beaver street, and thence into Cortland avenue. On the west side of the creek, West street and Johnson street afford excellent route for an intercepting sewer.

The sewer on the east side should certainly not be less than six feet in diameter at Adams street. The fall of the sewer can be one foot in a thousand from the south line of the city to Belden avenue, and a little more than this from Belden avenue to the lake. A sewer of this size and fall will of course not carry the storm water, which will come down in times of flood; but overflows can be arranged by which the surplus water may escape into the creek. Such intercepting sewers will relieve Onondaga creek of the greater part of the filth that is now poured into it, and there will be little difficulty in keeping its channel in a proper sanitary condition; but without the building of intercepting sewers it needs no prophet to predict that sooner or later the health of the whole city of Syracuse will suffer from the accumulations of filth in the creek channel. I therefore strongly recommend that the necessary surveys and plans should be made for this work so that it may be undertaken at the earliest possible moment.

WATER SUPPLY.

The water supply of Syracuse is mostly taken from Onondaga creek in the village of Danforth, just south of the city. Although for part of the year streams and springs on the neighboring hills contribute to fill the reservoirs. The water from the creek in passing into the pump-wells percolates through a rough filter composed of sand. This is used until it becomes so clogged with accumulations that the water will no longer pass through it. The sand is changed about once every two years. Such a filter is of little use except to take out the coarser particles contained in the water. The organic matter accumulating in this sand may decompose and the water that enters the pump wells may contain a larger amount of organic matter than that in the stream. A filter long in use becomes exceedingly dangerous from these accumulations of organic matter. The sand filter used at Syracuse water-works ought undoubtedly to be changed much oftener than it is.

As regards the purity of Onondaga creek, I was unable to make the necessary extended examination of the sources of pollution of the stream except in the immediate neighborhood of the water-works.

The natural drainage of the village of Danforth is into Onondaga creek, part of it above and part of it below where the in-take of the water-works is situated. The village is extending up the stream. Already it is quite possible that four or five hundred people are living in the village on the surface which drains into Onondaga creek above the water-works. These dwellings are none of them more than half a mile from the stream. The soil of the valley is porous, consisting of sand and gravel. Cess-pools and privies are used throughout Danforth. There is little doubt that the ground water and the ground air under the village is being polluted with this filth, and that the flow of the ground water in the southern part of the village is toward Onondaga creek. There is, therefore, a constantly increasing danger that the filth and the germs of disease from the village of Danforth may pass into Onondaga creek above the in-take of the water supply. This difficulty can be remedied by taking the water from a point on the creek so far south as to avoid the contamination at least from the districts forming the suburbs of the city. In addition to this a system of inspection should be kept up along the creek and its branches to prevent the pollution of the stream at any point along its course, otherwise the water supply of the city is at the mercy of any one who may carelessly build pig-pens, stables or privies over or near the channel.

In case typhoid fever should break out in some settlement above Syracuse and near the stream, and the excrement of patients should be washed into the channel, or should the waste water that has been used in washing the clothing of typhoid patients be thrown into the stream, there would be danger that the disease would be communicated to the susceptible people in the city through the water supply.

A large number of cases are on record where epidemics have been caused by a very small amount of typhoid poison reaching the water supplies of towns. Where a water supply is taken from a creek running through a valley settled as thickly as that of Onondaga creek a constant inspection is necessary to prevent danger, and even such measures may not always be successful.

FAYETTE STREET SEWER.

Complaint was made of the bad odors from the Fayette street sewer, and I have already suggested to your Board that plans should be made for the thorough ventilating and flushing of all the city sewers. The thorough ventilation of the sewers is absolutely neces-

sary to insure the health of the city. The death-rate of Syracuse is not large; but there is danger that, with the greatly increased use of the sewers for the carrying of excremental matter, the health of the city will not be what it has been in the past unless means are taken to keep the sewers clean and well ventilated.

JAMES T. GARDINER,

Chairman of Committee on Drainage, Sewerage and Topography.

At a special meeting of the State Board of Health, held at Albany, December 17, 1884, the above report of Director James T. Gardiner was presented and approved.

ALFRED L. CARROLL, M. D.,

Secretary.

REPORT ON THE ALBANY BASIN.

To the State Board of Health :

On the 24th day of September a petition was transmitted by the Governor to the State Board of Health, from a large number of prominent citizens of the city of Albany, setting forth that the Albany basin was in a condition dangerous to the lives and health of the people. As this basin is part of the Erie canal and the property of the State, the petitioners urged that the State Board of Health should investigate the sanitary condition of the basin, and, if found to be bad, should recommend the proper remedies. The petition was referred to the committee on drainage, sewerage and topography, and an investigation at once begun by the chairman of the committee, Director James T. Gardiner. This preliminary investigation proved that the basin was in a condition liable to injure the health of all brought within its influence, and that this influence was exerted in two important directions.

The principal sewers of Albany were found to be emptying into the basin, and the organic material brought down in them had so filled it, that at low tide large sewage flats were exposed, while the whole water surface was found to be bubbling with the gases of putrefaction liberated from the bottom at low and half tide. Beside the evil effects which must result from the exposure to the heat of the sun of large masses of sewage, and of a large extent of polluted water, it was found that this polluted water probably reached the point of intake of the city's supply from the river. These considerations induced the chairman of the committee to order a survey made of the basin showing its condition at low tide, and also a series of experiments on the current of the river, which should determine whether or not the waters of the basin reached the intake. These surveys and experiments were made by Mr. Horace Andrews, C. E., and his report and maps, together with a detailed account of the current experiments, are appended to this report. The Secretary

of this Board has also made microscopic examinations of the character of the specimens taken from the bottom of the basin. We will briefly sum up the condition of the basin, describe its relations to the health of the city, and recommend such remedies as seem necessary for the preservation of the public health.

REPORT.

The dock front of Albany is a curve concave toward the city. Across the chord of this arc is built a pier about four thousand feet long, parallel with the current of the river, leaving between it and the dock front proper a basin four thousand feet long and from one hundred and fifty to four hundred and fifty feet wide, containing some thirty acres. Into the northern end of this basin opens the Erie canal. The pier has in it three openings: one at the northern end; one opposite Maiden lane, through which ferry boats enter; and one at the southern end. This basin was intended as a harbor for canal boats, and it was expected to maintain in it seven feet of water at low tide. The basin has, however, become filled with mineral and organic matter from two sources, so that now at low tide from five to six acres of the bottom are laid bare and the remainder of the basin has become so shallow that it is not navigable at low water except where, by constant dredging, sufficient depth is maintained. It has been filled at the northern end and along the pier largely by silt brought down by the Hudson river in time of flood. This deposition of silt in quieter waters is a process now going on behind all of the piers that have been built for the rectification of the channel of the river. The second cause of the filling of the basin is the fact that fifteen sewers of the city of Albany empty into it. These fifteen sewers drain seven hundred and fifty acres of the most thickly populated part of Albany, carrying off the waste of some thirty-two thousand people. Mr. Andrews estimates that twelve hundred cubic yards of material are annually brought down into the basin by these sewers, of which probably at least half or six hundred cubic yards are deposited in the basin. The examinations of the deposits show that over a large part of the basin the bottom is a mass of black decomposing organic matter, filled with a writhing mass of worms and microscopic organisms. So great is the amount and so rapid is the rate of decomposition in this mass that as the tide falls and the pressure is removed, the gases of decomposition rise to the surface of the water, which bubbles and breaks

constantly, throwing into the air both the gases and the organisms, which probably rise with the gases of putrefaction. The Albany basin has, in fact, become a gigantic cesspool nearly filled with rotting filth. This filth is not merely at the mouth of the sewers, but is found out to the very channel of the river. The water of the basin is not only polluted with the waters of the sewers, which bring down in solution an enormous amount of filth, but the filthy deposits of the bottom of the basin are constantly stirred into the waters by the movement of steamboats, which sometimes throw up the bottom in black masses as large as a hat. The air currents which pass over this basin at low tide are contaminated not only by contact with several acres of decomposing sewage, but the water surface itself is giving off to the air gases and organic matter which are liable to become a fruitful cause of disease. A glance at the map will show how many people are exposed to these influences. Stanwix Hall and the Delevan House stand within a few hundred feet of the basin. Two railroad stations are close upon its banks; the principal ferries and steamboat landings are either in the basin or close to it; some of the principal business houses of Albany are on the docks; hundreds of the young men of Albany have the boat-houses of their boat clubs in the Albany basin, and in summer go down to their boats at night and morning, the very hours when the miasms of the basin are most liable to affect them. There can be no question that the maintaining of a gigantic cesspool, thirty acres in extent on the principal water front of the city of Albany, is contaminating the air of that part of the city and needlessly endangering the lives and health of all who are brought within its influence.

WATER SUPPLY.

The polluted waters of the Albany basin are not only contaminating the air which passes over them, but are almost certainly reaching the city water supply. The intake pipe for the pumping works passes under the basin and draws its water from the pier front, twelve hundred feet above the Maiden lane opening into the basin, that is, twelve hundred feet above the ferry slip. The channel passes close to the pier. It is twelve and one-half feet deep in its center, and the center of the channel is only one hundred and twenty-five feet from the intake pipe. It is a mistake to suppose that the water of the Hudson in front of Albany runs always down the river. The fall from Albany to New York is so slight that

through many months of the year the tidal effect of the flood tides at Albany overcomes the natural southward current of the river, and for three hours of each tide the current is reversed and runs from south to north. The detailed experiments of Mr. Andrews, by which this is proven, are given in the appendix of this report. These experiments merely verify a former series of experiments made under the United States engineers when Captain Willard was in charge of the office in Albany. The results of Captain Willard's experiments have never been published, and we have been unable to get the notes of his results, but at the time they were made he verbally communicated them to the chairman of this committee. They are thoroughly in accord with the results reached now by Mr. Andrews. The present State Engineer and Surveyor has also made experiments in this direction and reached the same conclusion.

Mr. Andrews' experiments show that the flood current at the time of his observations set to the northward thirty-four hundred feet, running about three hours; not merely the surface current, but the current at mid depth; and sometimes, as his results show, the current at mid depth did not run in the same direction as the current on the surface. The observations were taken in the channel, where, of course, the northward flood tide has the greatest amount of current to overcome. It took about one hour for the water in front of the Maiden Lane outlet of the basin to reach the inlet pipe of the water-works. For two hours, therefore, the water which had come from below the Maiden Lane outlet of the basin was running northward past the intake pipe, and then when the tide turned this water ran back in about an hour. It appears, therefore, that for three hours of each tide the water pumped into the city is water which has come from below the Maiden Lane outlet of the Albany basin. This water, it will be remembered, is the water which the basin has emptied out in the last hours of ebb tide. It contains the dregs of that basin, for the water which flows from it at the end of ebb tide must be the most polluted, and this is the water which is carried northward and passes and repasses the intake pipe of the city water-works. The fact that the center of the channel lies one hundred and twenty-five feet out from the front of the pier, and that the most rapid current is in the center of the channel, will tend to keep the water emptied by the basin on the west side of the channel; that is, the water that leaves the basin toward the end of ebb tide would not naturally cross the channel toward the east side of the river, but would be kept

along the west shore, and when the current sets to the northward it will flow in a stream between the channel and the pier, and possibly be delivered to the water-works with comparatively little dilution. The pumps of the water-works are kept going for some twenty hours each day, without any reference to the state of the tide. Beside the pollution from the Maiden Lane outlet of the basin a certain amount of water is poured out at the northern end and reaches the water supply on the ebb tide; this amount varies with the season. When little water is being discharged from the Erie canal, as in winter, the flow of the polluted water from the north end of the basin will be larger than at other times. The river above the basin is also polluted by the entrance of Patroon creek, bringing with it the sewage of quite a large population. Some have supposed that the polluted water from the Albany basin would purify itself before reaching the water-works' intake. But this is simply impossible. The water coming from the sewers and the water of the Albany basin not only contain a large amount of organic matter and sewage in suspension, but a very large amount in solution. The suspended matter has different specific gravities. The coarser particles are deposited soon after the sewers discharge into the basin, but the finer particles are carried on and float in the current for a long time. The character of the deposits at the Maiden Lane opening into the river channel show that a large amount of organic matter is carried as far as this point. The stronger the current the greater its capacity to bear up the particles carried in suspension. Sewage matter which would be deposited in the still waters of the basin would at once be floated along if it passed into the current outside of the pier. While comparatively large masses of sewage are deposited inside of the pier there is little deposited outside of the pier, because the current is strong enough to bear it up and carry it on into some stiller portions of the river. Were it not that the channel of the river runs immediately outside of the pier, sewage deposits would form there also. Impurities which are in solution in the water and which constitute more than half of the pollutions from sewage, of course do not settle. They can only be removed by oxidation, and such oxidation certainly will not take place in the short distance of twelve hundred feet between Maiden Lane opening and the water-works' inlet. The impurities, therefore, which are reaching the water supply of the city of Albany are the suspended matters which are floating in the water, and the soluble matters which constitute a large por-

tion of the filth discharged from the sewers. For six hours every day a mass of polluted water which is poured out of the Maiden Lane opening of the Albany basin and out of its southern end is drifting by the intake of the city water supply and is pumped up for the use of the citizens. As the basin grows shallower the waters become more and more polluted both on account of the accumulations of filth and from their being constantly stirred by the paddle wheels of steamboats. Whatever may have been the purity of the water when the water-works first took their water from the river, there is every probability that it is now polluted for many hours of the day.

REMEDY

The remedy for these evils is very simple, although it may be expensive. So long as the Albany sewers continue to empty into the basin it will rapidly fill with filth and be a nuisance. The city of Albany should build an intercepting sewer parallel with the river into which all the sewers of the city should empty and which should carry the sewage to some point so far below the city that it would not return along the city front with the up-flowing current of the flood tides. The basin itself should be either dredged out or filled up, whichever may be most for the interests of navigation and commerce. The basin was established for the convenience of commerce, and the question whether it should be maintained or done away with should be settled by the authorities who have these interests of the State in charge. The Superintendent of Public Works, the State Engineer and Surveyor, and the citizens pecuniarily interested in navigation, as well as the United States authorities who have been studying the preservation of the channel of the river, are all better fitted to judge of this question than your committee. There are strong reasons why it would be better to keep the basin open. But either the cleaning of it out or the proper filling of it would answer the sanitary requirements of the case. Something should be done at once to prevent the exposure at low water of the five or six acres of sewage flats, whose area will doubtless be increased during the coming season. It is the judgment of your committee that reasonable time should be given the city of Albany to build an intercepting sewer, and that, after that time has elapsed, the city should be forbidden to discharge any more sewage into the Albany basin. The building of an inter-

cepting sewer is, in our judgment, essential to the proper disposal of the sewage of Albany. If it is decided to dredge the basin, it ought to be done as early as possible in the coming spring, when the current of the river is so great as to overcome the flood tide, so that no water from the basin shall reach the intake of the city water. When the dredging is going on, the water of the basin will be most grossly polluted, and the danger to the water supply of the city will be very much increased, provided it should reach the pumping-works. The filling of the basin would be a comparatively slow process, and it is doubtful whether, if done at all, it would be accomplished in time to prevent danger during the coming season. In view of the fact that the best authorities anticipate the coming of cholera to the country, it seems desirable that, whatever plan is decided upon, the sewage flats, at present exposed in the basin, should be dredged in the early spring, so that none of the bottom of the basin, especially the southern half of it, would be exposed to the sun. The legislature should provide the means for the execution of this work by the Superintendent of Public Works as early as the opening of the spring will allow. The postponement of the work until a time of low water would greatly endanger the water supply of the city.

OTHER WATER SUPPLIES.

While the cleaning of the Albany basin, and the diverting of the sewage of the city by an intercepting sewer would greatly improve the water supply of the city of Albany, it is by no means clear that it will be safe to take water from a river polluted by the sewage of thousands of people a few miles above Albany, in Troy, West Troy, Lansingburgh and other towns. Sanitary science during the last ten years has made great advance. It is now known that many of the waters which have carried into cities and towns deadly epidemics of typhoid fever and other zymotic diseases, show no impurity which chemistry is able to detect. The zymotic poisons are matter in some form, whether they be living organisms or not, which are too delicate to be detected by chemistry. The fact that the river water of Albany, when first taken for the water supply, appeared chemically to be reasonably pure, is no proof whatever that it does not carry, or may not carry, the germs of disease into the system of every one who drinks it. The investigations of this board into the epidemic of typhoid and typho-malarial

fever in Bath, Steuben county, during the past year, showed that the wells of Bath were unquestionably polluted with the sewage of the town, and that the drinking of these polluted wells was the cause, or the favoring condition, of the terrible epidemic; and while the chemical analyses of these waters failed to show any unusual impurity, when placed under the microscope that their polluted character could be easily detected, they were found swarming with bacterial life. The spread of typhoid fever by wells, springs or streams containing specific poison of disease, has been demonstrated by innumerable cases both in this country and in Europe, but chemistry has never been able to detect the poison. The waters may have the usual chemical purity, and yet be deadly to ten per cent of the people who drink of them, as was the case in Bath; while in other cases water chemically impure is sometimes drunk with impunity by great numbers of people. The experience of the past ten years has clearly demonstrated that the chemical test cannot detect the specific poisons of the zymotic diseases; and, therefore, the results of chemical analyses of the water of the Hudson river are no proof as to its safety for drinking purposes. The danger of pollution of the water of the Hudson river by specific poisons of the zymotic diseases will continue to increase in proportion to the population on the banks of the river above the city of Albany. Should there be a severe outbreak of cholera in Troy, South Troy or West Troy, or North or West Albany, during the coming season, no one could feel certain that the germs of cholera, or the specific poison, whatever it may be, would not reach the water supply of Albany. In view of these facts, your committee have already recommended that the city of Albany take measures to ascertain whether a pure supply of water, or a supply safer from pollution, cannot be obtained from some other source. After careful inquiry we cannot learn that the various possible sources of water supply to the city of Albany have ever been scientifically investigated.

CONCLUSION.

In view of the facts above stated we conclude, that the Albany basin, in its present condition, is a nuisance endangering the health of the citizens of Albany, and of all persons brought within its influence, by the effluvia emitted from the sewage deposits at low tide, and by probable contamination of the water supply of the city of Albany; that in view of the fact that the Albany basin is a part

of the Erie canal, and, therefore, the property of the State, it is the duty of the State either to clean out the basin or to fill it up, abating the nuisance by whichever means may be best for the interests of commerce and navigation, to serve which the basin was constructed; that as the principal cause of the Albany basin being a nuisance is the pouring into it of the sewage of the city of Albany, the use of the basin as a receptacle for the sewage of the city of Albany should be forbidden by law, giving reasonable time for the city to construct an intercepting sewer, which should deliver its sewage below the city; that the water supply of the city of Albany is probably now contaminated by the polluted waters of the Albany basin; and that, while the cleaning of the basin and the building of an intercepting sewer will very much lessen the danger from polluted drinking water, yet the fact that such a large population deliver their sewage into the river within six miles above Albany, renders it desirable that a supply of water less liable to contamination should, if possible, be found for the city. In view of these conclusions your committee recommend:

First. That the Governor declare the present condition of the Albany basin a nuisance dangerous to health.

Second. That he order the Superintendent of Public Works to dredge the basin as early in the spring as the work can be executed, to such a depth that at low water there shall be at least three feet of water covering the entire bottom.

Third. That he prohibit the city of Albany from pouring any of its sewage into the basin after January 1, 1886.

JAMES T. GARDINER, *Chairman*,
ERASTUS BROOKS,
GEORGE W. COOK, M. D.,
EDWARD M. MOORE, M. D., *President*,
ALFRED L. CARROLL, M. D., *Secretary*.

Committee on Drainage, Sewerage and Topography.

On motion, the report and recommendations of the committee were unanimously adopted by the Board and ordered transmitted to the Governor.

ALFRED L. CARROLL,
Secretary.

APPENDIX.

PETITION.

September 23, 1884.

To the Honorable GROVER CLEVELAND, *Governor of the State of New York :*

We, the undersigned, citizens of Albany, earnestly appeal to you, petitioning that you will direct the State Board of Health to investigate and report upon the following facts :

The canal or harbor connecting with the Hudson river, and known as the Albany basin, has shoaled and silted up so that little or no current passes through it, and banks of foul mud alternately covered and exposed by the tides, and emitting noxious gases, are impediments to navigation and above all serious dangers to the public health.

This evil exists where much business and where the means of public recreation are concentrated, and we respectfully ask that immediate relief be afforded by dredging away the poisonous mud, or such other works as are necessary for the public safety.

ROBERT GEER, 108, 109, 110, 111, 112, 114
and 115 Pier.

D. W. HERRICK, 98, 99, 100, 101.

R. P. LEWIS & SON, 2, 4 and 8 State st.

M. G. STONEMAN & SON, 55 and 56 Quay st.

A. P. W. PAPER CO., Hudson ave. and Quay.

STEPHEN H. PARSONS, Dean and Exch. sts.

HARVEY A. DWIGHT, 117 Pier.

A. M. COMBS, 118 Pier.

G. H. WAGGONER, 46 Quay street.

P. CUSHMAN & CO., 376 Broadway

STATE OF NEW YORK:

EXECUTIVE CHAMBER, }
ALBANY, *September 23, 1884.* }

Respectfully referred to the State Board of Health.

DANIEL S. LAMONT,
Private Secretary.

To the Hon. GROVER CLEVELAND, *Governor of the State of New York*:

We the undersigned citizens of Albany, earnestly appeal to you petitioning that you will direct the State Board of Health to investigate and report upon the following facts:

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Robert W. Gibson,
Robert Shaw Oliver,
Abm. Van Vechten, Jr.,
H. L. Thomas,
Frederic L. Mix,

H. R. Pierson, Jr.,
B. Fernow,
O. W. Meyrowitz,
Geo. H. Thacher, Jr.,
W. B. Wackerhagen,
Mohican Canoe Club.

Chas. Piepenbrink,
Geo. P. Whitney,
H. W. Garfield,

T. W. Cantwell,
James Hunter,
Wm. G. Janes,
Mutual Rowing Club.

J. B. Keith,
F. A. Wheeler,
Robert H. Kelly,
R. C. Case,
F. H. Case,
Chas. L. Garfield,
John Weyrich, Jr.,
Max Kurth,
Richard Hunter,
John F. Kennedy,

Edward Carroll,
Matthew Duggan,
Thos. Ritchie,
William Buchanan,
Andrew V. Thornton,
John S. Poslie,
William Ellsworth,
Peter Snyder, Jr.,
S. H. Shattuck,
G. P. Reisel.

REPORT UPON THE CONDITION OF THE ALBANY BASIN WITH
SUGGESTIONS AS TO ITS IMPROVEMENT.

JAMES T. GARDINER, Esq., *Chairman of Committee on Drainage,
Sewerage and Topography*:

SIR — In accordance with your instructions, I have prepared maps showing the hydrography and surroundings of the Albany basin

and the entire sewerage system of Albany. I have also made such experiments in regard to the tidal currents of the Hudson river as seemed necessary, in order that the question of the disposal of sewage now flowing into the basin could be properly discussed.

The results of my examinations are embodied in the accompanying report, which is herewith submitted:

PRESENT CONDITION OF THE ALBANY BASIN.

The Albany basin was formed some fifty-five years ago, by the construction of a long and nearly straight pier in front of the concave water-front of Albany.

Free access to the river is obtained both at the north and the south ends of the basin, and also through a large opening subsequently made in the pier opposite the foot of Maiden Lane.

The basin thus formed, by the pier on the east and the water front of the city on the west, is about four thousand feet long and varies in width from one hundred and fifty feet to four hundred and fifty feet.

The entire area of the basin is about thirty acres. The Erie canal enters the basin near its northern end by means of a double lock. Two bridges, one at the foot of State street and one at the foot of Columbia street, give means of access to the pier and to the numerous ware-houses built upon it. The shore ends of the two railroad bridges crossing the Hudson river are supported by piers placed within the basin. The available water front of the city is enlarged very considerably by means of the basin. A sufficient depth of water for the shipping is only retained at the river front of the pier through the natural scour of the current, and it becomes necessary to dredge in front of such places within the basin as are needed for dock purposes.

CAUSES TENDING TO FILL THE BASIN.

Various agencies are constantly at work tending to shoal the water of the basin, so that at very low water five or six acres of flats are bare. It is very evident that the pier acts in precisely the same manner as the other longitudinal dikes which have been built for the purpose of improving the channel of the river; and the basin is in very much the same condition as the areas behind the dikes. In times of freshet, when the river waters hold much matter in suspension, by virtue of their great velocity, a deposition of silt takes place behind the dikes, where the current is comparatively slow. In

the Albany basin the velocity of the current will naturally be much less than in the channel, and it is further retarded by the large number of piers of the various bridges. The deposit from the above mentioned cause would be a fine sand or silt, and such a deposit is plainly visible at low tide in some places within the basin, especially along the west side of the pier, between Columbia street and the upper railroad bridge.

Freshets, however, occur rarely and are of limited duration, moreover, the flats bare at low tide are, to a great extent, composed of a black, slimy mud, teeming with myriads of small worms and filled with organic matter. Gases from this vile mud can be seen bubbling up through the water in nearly all parts of the basin, as the tide falls and the pressure is diminished.

It will be of interest to make an estimate of the amount of solid matter brought down to the river by means of the city sewers. As can be seen from an inspection of the accompanying maps, there are fifteen sewers emptying into the basin. These sewers receive the drainage from seven hundred and thirty acres of the most densely built portion of the city, containing thirty-two thousand inhabitants. The solid matter brought down in the sewers is partly washed from the streets by rains, but to a greater extent is composed of excrementary and other matters from household waste. A moderately heavy shower of one-fourth of an inch of rain over the whole watershed would bring at a low estimate as much as fifty-nine thousand pounds of street washings into the basin. At one hundred and twenty pounds to the cubic foot this would amount to four hundred and ninety cubic feet. The solid matter of all kinds from house waste, not dissolved but held in suspension in the sewer water, would amount to at least eight thousand pounds, or eighty cubic feet daily.

Assuming that showers, amounting to one-quarter of an inch, over the whole area of seven hundred and thirty acres draining into the basin, would occur ten times in a year, there would be four thousand nine hundred cubic feet of street washings, besides twenty-nine thousand two hundred cubic feet of solid matter from house waste, brought into the basin in the course of a year. If only one-half of this matter is deposited in the basin, it would amount to a yearly filling of six hundred and thirty cubic yards of the vilest material imaginable. For many years this mass of pollution, the amount of which has just been approximately estimated, has, to all

appearances, been accumulating in the basin; being removed only at such places as were needed for dock purposes and for navigation.

It is therefore not without reason that numerous residents of Albany call for relief from the sickening odors of the basin, claiming that it has become a public nuisance, and is detrimental to health.

POSSIBLE CONTAMINATION OF THE CITY WATER SUPPLY.

It has been proved by various analyses of sewage that a much larger portion of mineral and organic matter is actually dissolved in the water than is held in suspension. The dissolved impurities will not be deposited in the basin, and before considering any plan for improving its condition it will be expedient to inquire whether the present method of disposing of the sewage can be a cause of pollution of the city water supply.

The Hudson river is the principal source of water supply to the inhabitants of Albany, and no methods of getting rid of the sewage now flowing into the basin, or of otherwise improving the sanitary condition of the latter, should be recommended that will make the danger of contamination of the water supply greater than it is at present.

The river water is brought to the pumping works by a conduit running along Quackenbush street, under the basin and through the pier to its river front.

The opening on the face of the pier is about four feet below low-water mark, the water at the face of the pier being nine or ten feet deep at low tide. The center of the channel, which is here about twelve and one-half feet deep, is only one hundred and twenty-five feet from the face of the pier.

The Patroon's creek, which carries considerable sewage, empties into the river about three thousand feet above the water inlet. With this exception all the Albany sewage is discharged either into or below the basin.

The most important question to consider, therefore, is whether any of the matters dissolved in the sewage, as well as the lighter suspended solids, can be carried *up* the river by the flood tide.

It is the opinion of many of those best informed on the subject that the water of flood tide moves *up* the river for several hours, except in times of freshet when the tidal action is imperceptible. Gen. John Newton, now chief of the U. S. Corps of Engineers, says, in contrasting the flood tide of the Hudson near Albany with the ebb: "The current of flood tide is more limited in its power

but has sufficient force when concentrated on a point, bend or shoal to cut it away," and in making further reference to the same subject, he says: "The velocity of the flood currents at Albany have been probably much underrated. It is certain that between Albany and New Baltimore both flood and ebb have, under most circumstances, sufficient force to move light materials."

These views were corroborated by observations taken twelve years after the remarks above quoted were written, in 1878, by the U. S. engineers opposite the lower part of the city. A very perceptible current was observed moving up the river at mid-depth at each flood tide.

To further investigate the currents of flood tide under various conditions I have made experiments, an account of which is appended to this report.

The conclusion reached from the experiments is that the downward current of the river is entirely overcome by that of the flood tide and, under ordinary circumstances, the entire volume of water then flows up stream, even with a head wind. Under favorable circumstances the water is carried northward 3,400 feet, and perhaps farther at times.

The upward flow commences gradually and is not apparent in the channel till the tide has risen considerably at the shores; it lasts about three hours and terminates much more abruptly than it commenced. The downward flow in the channel begins after a very short period of slack water, and very soon after the tide has commenced to fall at the shores.

It is quite evident that the soluble matters of sewage entering the river, even as far below the basin as Madison avenue, may at times be carried up to the water inlet. The polluted water inside of the basin may be brought into the river through the ferry opening at the foot of Maiden lane, and also at the southern end of the basin, by the ebb tide, and afterward be easily carried by flood tide to the water inlet, which is only 1,200 feet above the ferry opening.

The water within the basin is very badly polluted, and at each ebb tide it flows out into the river, through the openings mentioned, until the water in front of the lower end of the pier is thoroughly contaminated. The steamboats passing constantly in and out of the basin, and along the river, serve to mix the dissolved sewage as well as the lighter matters held in suspension with the water.

When the tide begins to rise the downward passage of the river water is slowly arrested, and the polluted water soon begins to

ascend the river, reaching the water inlet in about three hours after the rise begins at the shore. For the remaining two hours of flood tide the water passing in front of the inlet is all considerably mingled with sewage, and it will take at least one hour of the ebb tide for the contaminated waters, which have passed up the river, to flow down again below the inlet.

Since the current in the channel has undoubtedly greater velocity than at the shores, sewage passing out of the basin will, for the most part, be confined between the center of the channel and the face of the pier, and the water drawn into the mains will be much more contaminated than if it were taken from the eastern side of the channel.

The duty required of the pumps is so great that they are now kept at work for twenty hours out of each twenty-four; yet, with the present condition of the basin, it is manifestly most improper to pump the water for the last three and one-half hours of each flood and the first one and one-half hours of each ebb tide; for the water drawn in at such times cannot fail to be contaminated with sewage, unless an exceptionally strong north wind or heavy rains should check the tidal current.

A certain amount of polluted water may flow from the basin at flood tide, out of the northern opening, and afterward be carried to the inlet by ebb tide.

The large amount of water brought into the upper end of the basin by the Erie canal tends to check the upward flow of water, and it is only when the canal is closed at winter that serious contamination of the river water, by upward flow from the north end of the basin, may be feared.

Should a perceptible flow through the northern opening occur after the closing of the canal, there would hardly be an hour of the day when it would be safe to pump the river water through the present inlet without fear of contamination from Albany sewage.

If the sewage should be all discharged into the river below Madison avenue, there would seem to be little danger of any being pumped into the distributing reservoirs. Without going well above the city the water inlet could not have been located in a better position than at present, as far as contamination with Albany sewage is concerned. The remoteness of the channel farther up the river, where islands intervene, and the fact that sewage from Troy and other places must at any rate be received, probably influenced the water commissioners in selecting the present location for the inlet.

METHODS OF IMPROVING THE CONDITION OF THE BASIN.

The entire filling of a considerable part of the basin has been suggested as a remedy for the nuisance complained of ; this would improve the condition of the basin but would not prevent the sewage from polluting the water supply. The great expense of the undertaking would be an objection, and although a certain amount of filling could be attempted with advantage, it might not be wise to diminish the water area very much. The action of the tidal water flowing from the basin in scouring out the channel of the river must not be overlooked. The dock front within the basin is also of considerable value and could not be materially lessened without occasioning great inconvenience.

The best plan for improving the condition of the basin would be to exclude city sewage entirely from it, thus removing the cause of the present nuisance. The shoaling of the water, from deposits by freshets, could not well be prevented and the silt would still require occasional dredging for its removal, though the amount of such dredging would be lessened if the sewage was not discharged into the basin. It would be advisable to remove as much of the filthy mud from the basin as is practicable ; after which, with sewage excluded, the basin would be improved in every respect and whatever filling occurs in future would not be of an offensive nature. It would be well if the water-supply from Patroon's creek could be exclusively employed during the period of dredging of the contaminated mud, for the river-water would necessarily be made very foul indeed by the stirring up of the mud at such a time.

An intercepting sewer built along the dock front the entire length of the basin and discharging into the river, at least as far down as Madison avenue, would be a desirable means of keeping all sewage from flowing into the basin. The present dock front might with advantage be advanced ten or twelve feet into the basin, thus widening Quay street and giving much-needed room.

The aggregate area of the fifteen sewers discharging into the basin is equivalent to that of a twelve-foot circular sewer. A six-foot circular sewer, with openings at intervals near the top, to allow the comparatively clean storm water to escape into the basin, would probably be large enough for all needs. Toward the northern end of the basin the intercepting sewer could be of somewhat less size. The amount of sewage carried by Patroon's creek is comparatively small but it would be well, if the river water is to be retained for drinking and culinary purposes, to carry the sewage of this creek also into the intercepting

sewer. The fall of the main sewer, suggested, would be slight; an inclination of one in 1,000 could be secured, in all probability, and this would be sufficient with numerous storm-water openings into the basin, to discharge rain-water as rapidly as the lateral sewers would deliver it.

If the sewage should be thus excluded from the basin the flats bare at low tide would soon cease to be objectionable from a sanitary point of view, and the amount of dredging required would be lessened, as it would be limited to the usual deposits from freshets. The possibility of any of the Albany sewage reaching the water inlet would be extremely small if the intercepting sewer spoken of, terminating at Madison avenue, was built. It would be a great additional safeguard, however, if the conduit should also be extended up the pier about 1,000 to 1,200 feet, where an inlet could be placed in a position quite as advantageous in other respects as the present one.

Whether the small amount of sewage received from the cities and villages located on the Hudson and its tributaries above Albany can, under any circumstances, be detrimental to the health of those drinking the water, is a question which sanitarians feel inclined to answer in the affirmative. Most persons would undoubtedly prefer water that is known to be absolutely free from sewage, even in quantities so small as to be quite imperceptible by any known method of analysis.

From economical motives alone a gravity supply would be preferable to the present system, if it could be obtained without very great expense. If the amount spent for pumping the river water into the reservoirs averages \$200 per day, an equal expenditure would pay the interest on a bonded debt of \$1,000,000, at five per cent, and also pay off the entire principal in about thirty years.

Watersheds exist in Rensselaer county within a few miles of Albany which, judging from their size, the elevation of their streams and lakes and the nature of the soil, would furnish Albany with water, free from contamination, in quantities more than sufficient for present demands, and without the expense of pumping. A careful examination into the availability of these water-sheds has never been made, but would prove of great interest to all residents of Albany.

If the river water should be abandoned for drinking purposes it would still be important to exclude sewage from the basin and to discharge it into the channel of the river, where the solid matters

would be carried so far and be so widely spread as to be much less objectionable than at present.

Very respectfully yours,

HORACE ANDREWS, JR.,

Civil Engineer.

ALBANY, *November 22, 1884.*

DESCRIPTION OF CURRENT OBSERVATIONS.

The object of the measurements here described was mainly to prove the existence of a perceptible flow up stream at flood tide and also to prove that the flow did not exist merely on the surface. The distance to which the flow extended up stream was also determined under what seemed usual conditions, at a period when the river was running somewhat low. Although the flood tide may with strong southerly winds carry the water farther up the river than was observed on November 13, it is not probable that it does so very often.

Description of instruments for measuring the velocity of the current.

The double float, which has proved the most accurate and the simplest instrument for measuring the flow of large streams, was used in the experiments in question. In the first experiments a cubical box of tin, without top or bottom, fourteen inches on a side, was connected by a cord, one-ninth of an inch in diameter, with a cylindrical tin float having a diameter of six inches and height of five inches.

In the last experiment, on November 13, a box 0.9 feet by 1.66 feet and 0.83 feet deep, with a bottom but no top, was ballasted with stones until it sank, and was connected by a cord with a surface float of pine. The area of the float exposed to surface currents was 0.22 square feet, and the area exposed to the wind was 0.16 square feet. A cord one-ninth inch in diameter connected the float with the sunken box.

These floats are very similar to those used in gauging the Mississippi river. The ratio between the surface of the float and that of the submerged box was here a little larger than in the gauging experiments, but not enough so to materially influence the results.

It will be safe to assume that the rate of motion of the double float is governed almost entirely by that of the submerged box, whose

surface is much larger than that of the upper float, and that here, as in the Mississippi experiments, the action of the wind on the surface float was too small to be regarded. The greatest wind velocity noticed during the experiments was one thousand feet per minute, which would produce a pressure on the exposed surface of the float of only two and one-fourth ounces.

Details of Experiments.

The first experiment was made, partly to test the floats, at ebb tide. On October 28, at 4:01 p. m., the double float was placed in the channel, bottom of submerged float 6.3 feet below surface, opposite the north end of the basin, and in eleven minutes it had floated seven hundred and twenty-six feet down the river, reaching the center of the railroad freight bridge. In the next fifteen minutes the float moved seven hundred and ninety-two feet. The wind was north and light. The velocities were sixty-six feet and fifty-three feet per minute; according very well with the United States engineer's observations. This was the only experiment made on the ebb flow.

October 29, 1884, the tide was low at about 9:30 a. m. The wind had been northerly all the preceding night and the tide was remarkably low, probably a foot below mean low water. Experiments were made at the foot of Arch street.

10:26 a. m. Wind blowing one hundred and eighty feet per minute from N. E. Double float placed in channel of river on center line of Arch street. Bottom of submerged box 6.3 feet below surface.

11:06 a. m. Float had moved down the river as far as centre line of Mulberry street, the second street below Arch street. At this time it was noticed that the discolored water from the Aniline works was moving entirely up stream and had already passed about three hundred feet up.

The water in the channel was so filled with particles held in suspension, that the bright tin surface of the submerged box was not visible at a depth of five feet.

11:38. Float had moved only about forty feet since 11:10.

11:54. The float was seen to be moving up stream, and was therefore removed and placed at 12:00, noon, at the center line of Arch street once more, and opposite center of west draw-span of Greenbush bridge. Wind north-east, blowing 400 feet per minute.

12:52. Float passed center line of Greenbush bridge.

1:27. Float passed north end of draw-rest, objects floating on the surface still moved rapidly down stream.

At 1:45 P. M., the double float was sunk by a side-wheel tow-boat.

This experiment indicated that at a period of exceptionally low tide when the wind was N. E. and blowing at the rate of 400 feet per minute, or five miles per hour, the current of the flood tide was very perceptible at six feet from the surface in the channel. The up stream motion was first shown by the discolored water of the Aniline works at the shore, and afterward the deeper water in the channel moved northward, while it is most probable that the surface current was southward, on this occasion, during the whole time of flood tide. The tide could not have continued to rise much later than 2:30 P. M. For fifty-two minutes after 12 P. M., when the up stream motion was first observed, the current at six feet below the surface moved at the rate of 5.78 feet per minute, and in the next thirty-five minutes it moved very nearly at the rate of 8.6 feet per minute.

The conditions of this experiment were nearly as unfavorable to the theory of an up stream current as could be found, yet the water in the channel moved 600 feet up stream during the period of observation, and probably as much as 1,000 feet during the entire flood tide.

On November 3, 1884. The river was very smooth and the wind was barely perceptible, blowing only at the rate of one and a quarter miles per hour.

At 2:30 P. M., the tide was 1.2 feet above mean low water and was rising. A floating object placed at 3:04 P. M., at the center of the Greenbush bridge and in the channel of the river, had moved as far up stream as the center line of Madison avenue, by 3:59 P. M., a surface velocity of about eighteen and one-half feet per minute. In this case the river was so very smooth that the surface velocity would be a good criterion of the velocity at greater depths.

The most complete experiment on the flow of the river during flood tide was made on November 13. The conditions were favorable for an upward flow, inasmuch as there was a fresh breeze from the S. W., but such a wind is of so frequent occurrence at Albany, that the experiment may be said to have taken place under very usual conditions.

According to the Signal Service observations at Albany, in 1880, during the summer and autumn the wind was from the south-east, south and south-west 239 times out of 549, or in about 43½ per cent of all cases observed.

On November 13, 1884, at 9:15 A. M., the tide was 0.3 feet above mean low-water, and was rising. The double float and objects floating in the channel passed down the river till about 10:45. The wind was south-west and blowing 10.8 miles per hour.

At 11:15 A. M., the double float was placed at a point in the channel of the river a little below the south end of the pier.

The bottom of the submerged box was 7.9 feet below the surface in this experiment. The float was carefully followed and its position recorded at intervals, till the tide turned and its motion was reversed. The wind and tide observations were as follows:

9.15 A. M. Tide 0.3 feet above mean low water.
 10.45 A. M. Wind 10.8 miles per hour. S. W.
 11.00 A. M. Tide 0.8 feet above mean low water.
 11.45 A. M. Wind 11.4 miles per hour. S. W.
 12.36 P. M. Tide 1.7 feet above mean low water.
 12.55 P. M. Wind 7.1 miles per hour. S. W.
 1.27 P. M. Wind 7 miles per hour. S. W.
 1.57 P. M. Wind 4.5 miles per hour. S. W.
 2.48 P. M. Wind very light, changed to N. W.

The float passed very near to the center of the channel throughout its whole course and was not disturbed very much by tows. It passed close to the west side of the draw-rest of the passenger railroad bridge and stopped its upward motion about fifty feet south of the freight railroad bridge and opposite the middle of the first panel east of the draw.

The rate of motion of the float is shown in the accompanying table:

Time of observation.	Minutes between observations.	Distance traveled by float.	Entire distance passed over.	Velocity of float, feet per minute.	
A. M.		Feet.	Feet.		
11.15	.....	.....	.....	.....	Near S. end of pier.
11.31	16	210	210	13.1	Opposite S. end of pier.
11.52	21	485	695	23.1	At S. end of draw-rest of railroad bridge.
12.00	8	145	840	18.1	At center of railroad passenger bridge.
P. M.					
12.25	25	510	1,350	20.4	Opposite center of ferry opening in pier.
12.56	31	575	1,925	18.5	At line of Columbia street.
1.34	38	695	2,620	18.3	In front of inlet to water conduit.
2.12	38	700	3,320	18.4	Opposite S. end of draw-rest of R. R. freight bridge.
2.31	19	80	3,400	4.2	Float stationary.
.....	196	3,400	.....	17.4	Average velocity.

A surface float was timed between the first and second points and also between the second and third. The velocities were thirty feet and thirty-seven feet per minute, respectively. The surface water was evidently moving very rapidly in comparison with the water at the depth of the submerged box.

The points were all located by ranges with sufficient accuracy to be plotted on the charts of the United States engineers, so that the distances between successive points of the float, as well as its relation to the channel, were known quite closely.

It would be useless to determine the distance passed over by the float with very great accuracy, unless an extended series of observations were to be attempted. The error occasioned by employing distances derived from the charts is very small and the main facts relating to the velocity of the flood current and the extent to which the water of the river is carried up-stream are, it is believed, revealed by the experiments above described. The constant passing of steamboats and tows renders very precise observations of the currents impracticable directly opposite the city where it was most important that they should be conducted.

Very respectfully,

HORACE ANDREWS, JR., *C. E.*

ALBANY, *November 22, 1884.*

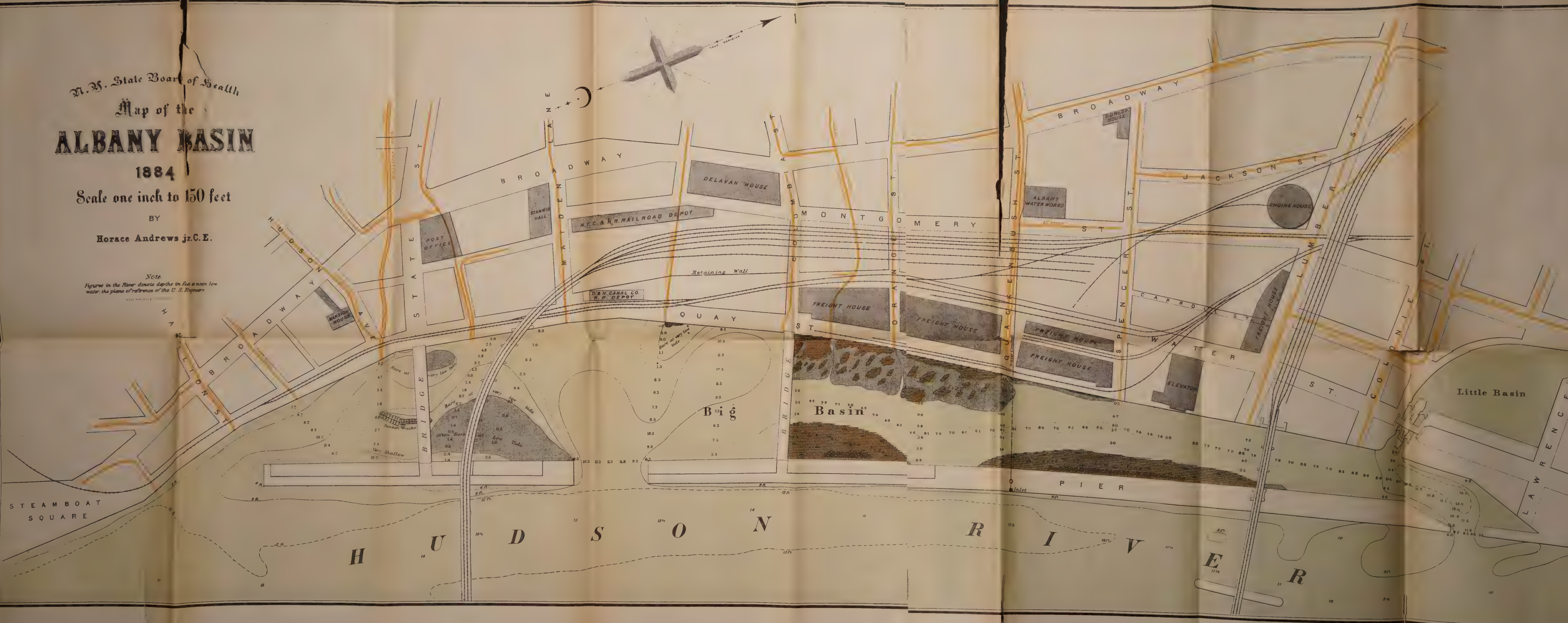
N. Y. State Board of Health
Map of the
ALBANY BASIN

1884

Scale one inch to 150 feet

BY
Horace Andrews Jr. C. E.

Note.
Figures in the River denote depths in feet at mean low water, the plane of reference of the U. S. Engineers.







NOTES.

Colored lines show the location of Sewers.
The Figures in the Hudson River indicate
the depth at mean low tide.

N.Y. STATE BOARD OF HEALTH
MAP OF THE
CITY OF
ALBANY
NEW YORK

Showing the sewers and water
courses draining into
the Hudson River.

Scale 15000
1884



A
REPORT
ON THE
SEWERAGE OF MT. VERNON.

To the State Board of Health:

Early in December a petition was received from a large number of the principal citizens of the Village of Mt. Vernon, Westchester county, stating that a small but living stream, running through a part of the village, is made to receive a filthy discharge from sewers which extend through some of the principal streets, and that the stream is thus rendered a foul smelling and unwholesome open sewer, the stench of which is said to be, under some conditions, perceptible at a distance of two or three thousand feet from the stream. The petitioners state that this state of things has existed for several years, and that repeated appeals to the village trustees and the local board of health have been ignored. Last year, it is said, the conditions were made worse by extending the sewers within the village, thus increasing the volume of filth with which the water-course is polluted. The petitioners add, that failing to find relief from the local authorities, they are compelled to ask that the State Board of Health intervene in their behalf.

This petition and the names of the citizens signing it are herewith appended.

As soon as possible after the receipt of this petition, about the middle of December, Mr. Horace Andrews, civil engineer, in the employ of the Board, was sent to examine into the existence of the alleged nuisance, and also into its causes and the best remedy

therefor. The sewer complained of is the outlet of a small system of sewers built ostensibly for carrying storm water and spring water only, and there are severe village ordinances against the draining into these sewers of any excremental matter. In spite of these facts, the water made foul in human dwellings, and the foul street washings come through these sewers in such quantities as to be readily observed at the outfall, although it was not demonstrated to Mr. Andrews' satisfaction that human excrement was passing through the sewer. The amount of filth however which is collected by these sewers from other sources is so great as to dangerously pollute the water of the creek, and to cause deposits of organic matter in its channel which in a state of decomposition undoubtedly endangers the health of the people.

This opinion of Mr. Andrews is corroborated by the statements of two succeeding health officers of the village, and by the testimony of a large number of influential citizens. The fact that a large amount of foul organic matter is deposited by this sewer in and along the channel of the stream is beyond question, and that this material is so great in quantity that its decay causes a serious nuisance. This committee therefore recommends that the State Board of Health declare the conditions herein described a nuisance dangerous to life and detrimental to health.

The committee have considered the recommendations of Mr. Andrews respecting the best remedy for the evil. It appears that the village of Mt. Vernon is just introducing a system of public water supply, and that there are no sewers in the village intended to carry off sewage, but that cess-pools and privies are used throughout the town. The dangers from cess-pools and privies have been so clearly set forth to the people of the State, that they need not here be dwelt upon; but whatever danger there may be in the use of cess-pools before a public water supply is available, the introduction of water, leading, as it does, to the use of three or four times as much per capita, as is consumed when wells and cisterns are the only sources of supply, introduces a new element of danger. There being no sewers, all the water fouled by use in water-closets, baths, and sinks, must find outlet into the soil, which thus becomes saturated with polluted water. Most serious epidemics often follow the introduction of an ample water supply into towns where cess-pools have been for many years in use, and which have provided no sewers to carry off the waste water. It is therefore most important for the public health of Mt. Vernon, that a system of sewerage should be at

once constructed to carry off the sewage of the village. The present sewers are available and useful only for storm water and no sewage should be admitted to them. We therefore advise that the separate system of sewers, consisting of small glazed pipe flushed with automatic flush tanks should be adopted and built at the earliest possible moment by the village of Mt. Vernon. As the construction of the sewers may take some time, we recommend that the out-fall sewer of this system be constructed first in accordance with the plan proposed by Mr. Andrews, and that this out-fall sewer, which would be made of twelve-inch glazed pipe, be used as an intercepting sewer for taking the low-water flow from the system of rain water sewers in accordance with the plans.

By an ingenious device, which is described by Mr. Andrews, the twelve-inch pipe of the separate system can be made to carry not only the low-water flow from the storm-water sewers, but also the first part of the flow in times of storm, which is often very foul on account of the street washings which come down into these sewers.

This admirable plan, suggested by Mr. Andrews, will in the opinion of the committee completely relieve the Mt. Vernon brook from pollution, either by sewage from dwellings or by foul matter washed in from the streets in times of rain.

The out-fall sewer recommended is to extend from Mt. Vernon to Hutchinson's creek, a distance of from eight to ten thousand feet. The sewage passing along this pipe will empty into Hutchinson's creek, just above the point reached by salt water. The absence of dwellings from the neighborhood of this creek, and the amount of water flowing in it, render it improbable that any nuisance will be created by the sewage emptied into it. Still it is possible that at some future time the region between Hutchinson's creek and the Sound might become inhabited, and the condition of the channel of Hutchinson's creek become a nuisance. In this case it would be necessary for the village of Mt. Vernon to purify or partially purify its sewage before allowing it to pass into the creek.

It is therefore desirable to make provision for this in the beginning by selecting a place in the line of the out-fall sewer, where small precipitation tanks can be easily constructed. Small tanks for the precipitation of sewage by means of chemicals need cause no nuisance to the neighborhood in which they are situated; and yet it would be better to have them at some distance from the localities that are to be thickly settled.

Wherever these tanks are erected, an abrupt drop of a few feet will be required in the line of the sewer, and it is desirable in selecting the grades for a sewer, that this should be taken into account in the beginning, and the grade so arranged that precipitation tanks can be erected whenever required.

The out-fall sewer extending from the mouth of the present sewer to Hutchinson's creek should be built as early in the spring as possible, and the channel of the village brook cleared out before the hot weather.

As regards the cost of this out-fall sewer, which in the beginning will act as an intercepting sewer for the sewers now built, I may say that a twelve-inch pipe is now being laid in Schenectady, six feet under ground, for forty-five cents a lineal foot, including all costs for excavation, pipe, material and labor.

The man-holes on the sewers are costing \$30 each. There would need to be perhaps ten man-holes between Mt. Vernon and Hutchinson's creek. Mr. Andrews has estimated the cost of this intercepting or out-fall sewer at \$6,500, which allows for a higher cost per lineal foot than that paid at Schenectady.

Recommendations. This committee therefore recommends that the Board declare the condition of the brook into which Mt. Vernon sewers empty is a nuisance, dangerous to life and detrimental to health, and that the Board advise that it be abated at the earliest possible time, substantially set forth as in the plan of Mr. Andrews herewith appended.

*Committee on Drainage,
Sewerage and Topog-
raphy.*

{	JAMES T. GARDINER,	<i>Chairman.</i>
	ERASTUS BROOKS,	
	GEORGE W. COOKE, M. D.,	
	EDWARD M. MOORE, M. D.,	<i>President.</i>
	ALFRED L. CARROLL, M. D.,	<i>Secretary.</i>

At the quarterly meeting of the State Board of Health, February 17th, the above report was submitted, and on motion approved and ordered transmitted to the trustees of the village and the local board of health of Mt. Vernon, as the conclusions of the Board.

ALFRED L. CARROLL,
Secretary.

APPENDIX.

PETITION.

The undersigned, living in and near Mt. Vernon, a village of several thousand inhabitants in Westchester county, ask your attention to a grave sanitary abuse from which many people here have long been suffering. It is of the following nature:

A small but living stream, running through a part of the village, is made to receive the filthy discharges from a sewer which extends through some of the principal streets of the place. The stream is thus rendered foul-smelling, and otherwise disgusting and unhealthy — an open sewer, in fact, during the whole year — and is especially abominable during the warm, dry weather of summer. Those living along its course, both within and outside the village, for a distance of 2,000 or 3,000 feet, are seriously annoyed by the stench arising from it, and the health of many has been injured by its influence.

This state of things has existed for several years. Repeated appeals to the village trustees and the local board of health concerning it have been ignored; and last year the condition of things was made worse by extending the sewers within the village, thus increasing the volume of filth with which the water-course is polluted.

We are the victims of corporate indifference and ignorant stupidity, and having no hope of relief at home, we are compelled to ask that State authority interfere in our behalf.

Christian Von Hesse,
Emily Von Hesse,
Mary MacKaye,
Edward H. Betts,
S. S. Pevear,
W. J. Youmans,
B. Franklin Bernstein,

James D. Irwin, .
Saml. Bernstein,
Thomas Thorn,
Wm. L. Marcy,
G. G. Wagner,
J. Frank Hull,
Chas. M. Moseman,

Wm. A. Miles,
Robert Taylor, M. D.,
Geo. S. Miller,
R. D. Watson,
E. A. Youmans,
Edward L. Youmans,
W. R. Austin,
Geo. W. Woosler,
S. L. Close,
A. M. Campbell,
Hiram J. Collins,
H. J. Badenhauser,
B. Hufnagel,
Edw. S. E. Phipps,
W. Koch,
Alfred Cooley,

Charles J. Chatfield,
Wm. Blake,
J. A. Brown,
Robt. Marks,
Peter Sheridan,
Michel Powers,
Patrick Fraley,
John Le Page,
Gustav Schindler,
N. A. Lawlor,
A. E. Crowley,
Joseph Gagg,
William Kortlang,
John Kapp,
George W. Kapp,
Valentin Hinkelbein.

REPORT UPON A NUISANCE AT MOUNT VERNON, WESTCHESTER COUNTY.

JAMES T. GARDINER, Esq., *Chairman of Committee on Drainage,
Sewerage and Topography :*

SIR — According to your instructions I have examined into the causes of complaint regarding a nuisance at Mount Vernon, and herewith submit my report.

GENERAL DESCRIPTION OF THE VILLAGE OF MOUNT VERNON.

The village of Mount Vernon is less than fourteen miles by rail from the Grand Central Railroad Depot in New York, and a large number of its inhabitants carry on business in the city. Owing to the ease of access of Mount Vernon its growth has been very rapid of late, the census of 1880 indicating an increase of seventy per cent over the enumeration of 1870. The entire number of inhabitants was 4,586, according to the last census.

The village is somewhat scattering, as there is a tendency toward ownerships of one or two acres or more, but there is a solidly built portion of the village containing at present perhaps as many as 3,000 inhabitants.

In estimating future growth of the village it is safe to predict that the most important increase in numbers will be in the solidly built portion, although the village may become spread over a still larger area than at present, and a considerable growth be evident by an increase in the number of villas and detached houses in the outskirts.

The land upon which the village is situated consists of a number of low hills, of clay in places, and elsewhere of deep beds of gravel. Near the railroad station the land is quite level, and a peat swamp covers several acres.

The streets of the more compactly built portion of the village slope to the north and north-west, the natural drainage being into a small brook which is a branch of Hutchinson's creek.

SEWERAGE OF THE VILLAGE.

About twelve years ago sewers were built in some of the streets for the purpose of readily removing the storm water and that from springs. It was feared by some that these sewers might be used for house drainage, thus causing the effluent to become a nuisance. An injunction was therefore obtained restraining all persons from discharging house waste into the sewers.

At different times the sewers have been extended until they are now about as represented upon the map of the village accompanying the petition.

The main sewer, extending along Fourth avenue, is of brick, oval in cross section and having a greatest internal diameter of about three feet. The sewers along Third and Fifth avenues, which join the main sewer near the railroad station, are of fifteen or eighteen inch vitrified pipe. The Fifth avenue sewer carries the water from springs in the upper part of the village.

The main sewer discharges about 700 or 800 feet north west of the railroad station, the effluent passing along the borders of the peat swamp already mentioned and being considerably augmented by water draining from the west. The course of the small brook thus formed is indicated upon the accompanying map; it flows about a mile and a half from the mouth of the sewer before reaching Hutchinson's creek, the latter soon afterward becoming mixed with the salt water of Long Island sound.

NUISANCE CAUSED BY EFFLUENT FROM SEWERS.

Although, as stated, an injunction restrains the inhabitants from discharging house drains into the sewers, still there have been complaints for the last four or five years as to the foul nature of water discharged from the sewers. It is very evident that rain water flowing from the streets must carry a considerable amount of filth into the sewers, especially where the inhabitants pour waste water into the streets and gutters to a considerable extent. It is also believed by some that neither the liability to fine from a transgression of the law, nor care for the comfort of those residing near the sewer outlet has proved a sufficient motive to prevent some of the residents from discharging their house drainage directly into the sewers.

However filth may get into the sewers, there is no doubt but that it does so, and that the small brook receiving the discharge has been converted from a stream of pure and sweet water into a dirty and vile-smelling open sewer. The health officer, in his last report, says: "The open sewer through the swamp north of the depot cannot but be a source of disease with favorable atmospheric conditions." In June, 1881, the health officer remarks in his report. "It is a question whether great damage has not resulted to many households having connections with the sewers, who, abiding under the delusion that they were only used for water drainage from cellars and the like, have failed to provide proper traps and other safeguards against the invasion of sewer gases into their houses." During the same summer the nuisance arising from accumulations of filth and from offensive waters issuing from the sewers became so great that the health officer presented to the local board of health a remonstrance, signed by a number of citizens of the village, asking for relief. In presenting this remonstrance the health officer, Dr B. J. Burnett, concludes by saying: "Steps looking to the relief of the individuals who are the complainants must soon be taken by the health department of this village to avoid the interposition of the State Board of Health."

At the time of my visit, Monday, December 15, 1884, a heavy rain had occurred within twelve hours, which must have washed out the sewer and have removed surface filth from the streets. It might be supposed that the effluent water would be very nearly clean therefore. The spring water which can be seen near Third street before it passes into the sewer was quite clear and devoid of smell. At the mouth of the sewer, however, there was a very perceptible smell, while the water was much discolored and filled with ropy masses apparently formed by the mixture of soap and hard water. There was no room for doubt that large quantities of soapy water were flowing from the sewer, but whether this came from house-drains or from the emptying of wash tubs into gutters leading to the sewers, is difficult to decide.

In summer time the flow from the springs is quite small and the effluent from the sewer is commonly reported to be very offensive, at such times excrementary matters are said to be frequently visible in the sewer water, and the filthy nature of the muddy deposits along the banks of the brook confirms this statement.

It therefore appears that notwithstanding preventive laws and

complaints from residents of the village for a number of years, the sewers do now receive a large amount of house sewage; that the outlet is so placed that a naturally pure water-course has been defiled and rendered an intolerable nuisance and that repeated appeals to the local authorities have been entirely unavailing in affording relief to those residing along the course of the contaminated brook and to those who may innocently imagine that the sewers are only legitimately used, and hence neglect to provide traps in their cellar drains.

UNSANITARY METHODS OF FILTH DISPOSAL AND DANGERS TO BE APPREHENDED IN FUTURE.

Throughout the village of Mt. Vernon the generally adopted manner of disposing of house waste, and the only legal one available, consists in the use of the ordinary cess-pool and privy vault. Up to the present time there has been no public water supply and those who unfortunately live in the more densely settled part of the village must have been compelled to use wells more or less contaminated by the leachings from their own and neighbors' cess-pools.

The health officer in a recent report to the Board of Trustees states that: "Within an area bounded by First and Second streets and Third and Sixth avenues, there is not a well from which it is safe to use water. The soil in a large part of this territory is sewage-soaked to saturation."

An artesian well has recently been sunk in the higher part of the village, and at the time of my visit water-pipes were being laid, by which those residing along the course of the sewers, as well as many others, will doubtless soon receive a supply of water very much to be preferred to that furnished by the wells.

When the new water supply comes into use the cess-pools, which are even now inadequate, will soon cease to contain the extra amount of water which will be poured into them. If the ground is now 'sewage soaked to saturation' it will be an absolute necessity to provide some proper means of sewage disposal as soon as an abundant water supply comes into use.

PROPOSED REMEDIES.

There would seem to be no practicable means of remedy for the evils that have been the subject of complaint in the present petition except an effective system of sewerage. It is very doubtful if the nuisance complained of is of so dangerous a nature to the inhabit-

ants of Mt. Vernon as the complete saturation of their soil with filth from their drains. Already this latter evil is of appalling magnitude and no action can be too quickly taken to abate it.

Plans of sewerage of very great and indefinite expense have been made, and it is doubtless owing to the apparent magnitude of the undertaking that the inhabitants have for so long time suffered their health to be imperiled and the good name of their village to be brought in question.

The portion of the village that most needs sewerage is all situated on one drainage area and there is no reason why a system cannot be devised for it at once, leaving other portions of the village, which are but sparsely settled, until future needs may require other systems for them also. Without an abundant water supply it would have been useless to consider any means of sewerage, since the modern sewer is intended for the removal of household waste by means of water, but now that there is reason to believe that a liberal supply will be available there is no excuse for deferring action.

In Mount Vernon the present sewers remove the storm-water in an expeditious manner and seem to answer the purpose of their construction. The question to be considered is whether the present sewers can be so extended and otherwise improved as to remove house-waste and the ordinary sewage of the village, or whether it will be better from sanitary or economical reasons to adopt a separate system of sewers for removing sewage proper, allowing the present storm-water sewers to remain, and compelling the inhabitants of the village to use them for their legitimate purpose only.

If the present sewers are to be used for the reception of house-waste it will be necessary to provide some other outlet than the present one and the only one that would appear to be at all practicable would be by means of an extension of the main sewer to the point where Hutchinson's creek meets the salt water. By discharging the sewage, at this point, where the volume of water in the creek is considerable, the sewage would probably occasion no trouble until the village had grown to a much larger size than at present.

The objections to this extension of the main sewer would be that the cost of laying this large main a distance of from 8,000 to 10,000 feet would be very great and in dry weather the flow through it would be quite small, so that a very large extent of surface within the sewer would remain covered with filth, emitting noxious vapors to the annoyance and detriment of health of the village. If the village should further commit itself to the use of large sewers, hav-

ing the combined objects of the removal of storm-water and house drainage, the system will become a heavy burden to the community for frequent extensions will be called for to remove house-waste in places where there will be no trouble from storm-water for many years.

THE SEPARATE SYSTEM OF SEWERAGE.

To properly remove sewage from the village there would seem no other alternatives than to build an outlet sewer of considerable length or to discharge the sewage into settling tanks where it could be disinfected if necessary and the sludge, precipitated by chemicals, could be removed while the clarified effluent could flow off as at present. In either of these plans it would be desirable to exclude storm-water from the sewers, in order that in the first plan the diminished size of pipe may reduce the cost to a minimum, and in the second, the sewage may be as little diluted as possible.

It has been proposed that the sewage should be removed by allowing it to flow on suitably prepared land in the neighborhood of Pelhamville, but this plan appears wholly unsuitable for the case under consideration, since land is everywhere held at a high price, and there would be loud remonstrances against converting any land adjoining possible villa sites into a "sewage farm."

About one acre would be needed for every one hundred persons in the sewage farm suggested; from twenty-five to thirty acres would therefore be needed at present, which, with the necessary expense of preparing the land, would make this a very costly plan.

Although at some places the expense of operating sewage farms has been partially borne by the increased amount of crops, still, as far as past experience can be taken as a criterion, sewage can neither be utilized as a manure nor purified by intermittent filtration without considerable expense.

Where the principal value of land is that which it possesses as a site for residences, almost any other sanitary method of sewage disposal should be preferred to that of irrigation.

Taking all facts into consideration, it would seem to be the best as well as the cheapest plan to lay a twelve-inch pipe approximately along the course of the small brook, whose contamination is now the cause of complaint, until the sewage can be discharged into Hutchinson's creek at or near the point to which the tide rises. If the growth of the village should in future be so great that a perceptible nuisance would be caused by the discharge of the sewage

in the manner indicated, it could then be brought into tanks and precipitated and deodorized. Six or eight-inch lateral pipes would be needed in the main streets of the village with flushing tanks at their ends while the present sewers would remain to drain off the storm-water and to dry the subsoil as they now do.

It is not necessary to describe the separate system of sewerage in detail, as its main features are well known; it would seem to be peculiarly applicable to Mt. Vernon, as there does not appear to be any way to escape the use of an outlet pipe of considerable length, and the smaller the size of this pipe the less costly would the sewage removal be. The separate sewerage system has besides, many points to recommend it in a village like Mt. Vernon. From a sanitary point of view the small, well flushed pipes of the separate system would be much preferable to the large sewers of the combined system, which would in general carry only a very shallow stream of water and would emit disagreeable and unhealthful odors from which the separate system is nearly free.

The cost of the separate system would undoubtedly be much less than that of any other that could be devised, the principal expense being for the long outlet pipe. Careful surveys are needed before the actual length of outlet pipe required can be definitely known, but it would be cheaper to use such an outlet than to attempt to precipitate the solid matters of the sewage. The precipitation of sewage would require careful attention by some one instructed in the requirements of the case. Probably a number of years will elapse, before Mt. Vernon is of such a size as to render its sewage precipitation necessary for the health of those living near the mouth of Hutchinson creek.

A rough estimate of the expense involved in laying a twelve-inch pipe from 8,000 to 10,000 feet in length, with the necessary man-holes would be \$6,500, while the duplication of the existing sewers by six-inch pipes, together with ten manholes and three flushing tanks, would amount to about \$7,000 more. Future extensions of the sewers would involve less outlay than would be possible with any other system.

The entire abandonment of cess-pools and privies in the thickly settled portions of the village is certainly called for, as they are now saturating and polluting the subsoil and poisoning the air in the houses. Strict ordinances are needed relating to cess-pools and privy vaults, not only for the preservation of health of those residing in the central portion of the village, but also for improving the sani-

tary condition of those parts which may be without sewerage for a number of years to come, and where wells may still be in use after the introduction of the new water supply.

TEMPORARY EXPEDIENTS.

If the separate system of sewerage should be adopted at Mt. Vernon, it would be possible to obtain relief from the nuisance that is the occasion of the present petition by merely constructing the long outlet pipe, which would remove contaminated water to a point where it would occasion no trouble. Afterward the laterals, flushing-tanks, etc., could be added as occasion requires.

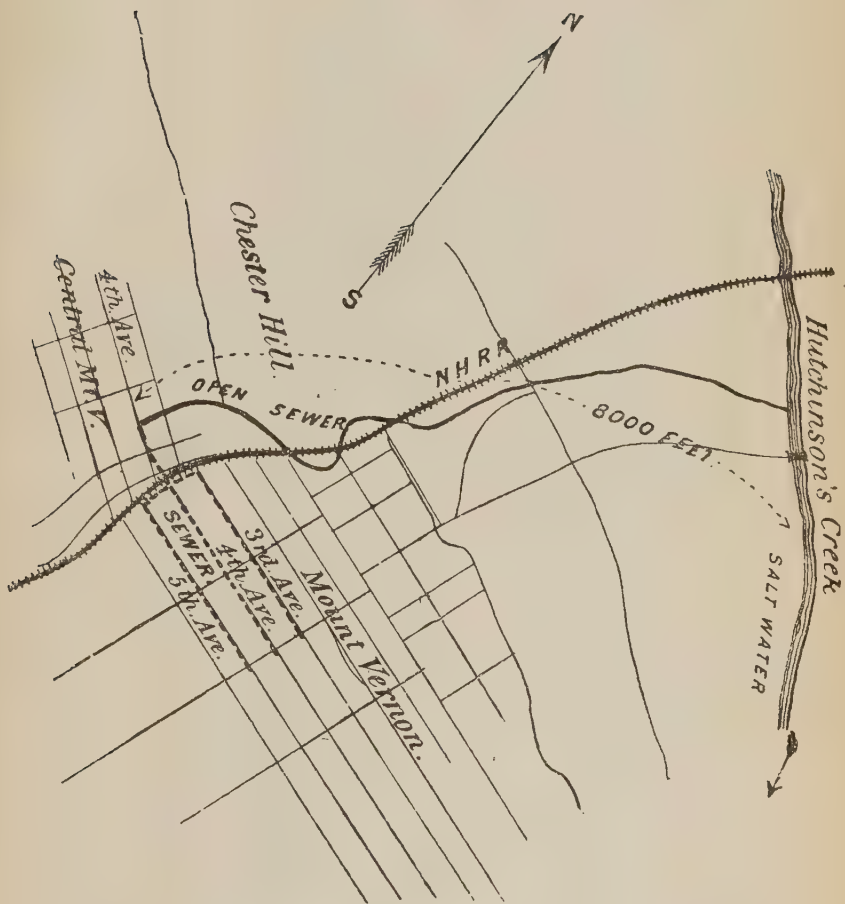
This temporary plan would call for the admission into the new outlet pipe of the ordinary dry weather flow from the present sewers, and also the first flow from the streets during a rain. The nearly clean water flowing out of the sewers, when the rain fall became heavy, could pass into the brook as at present. Even with the completed separate system of sewers, the first flow from the streets during a rain storm might well be admitted into the small outlet pipe, since the first water flowing from the streets, at the commencement of a rain, will be very nearly as impure as any other sewage.

The device that could be used to secure the admission of the dry weather flow from the present sewers, until the laterals are built, and the first part of any rain fall, would be a very simple one, as indicated in the annexed diagram.

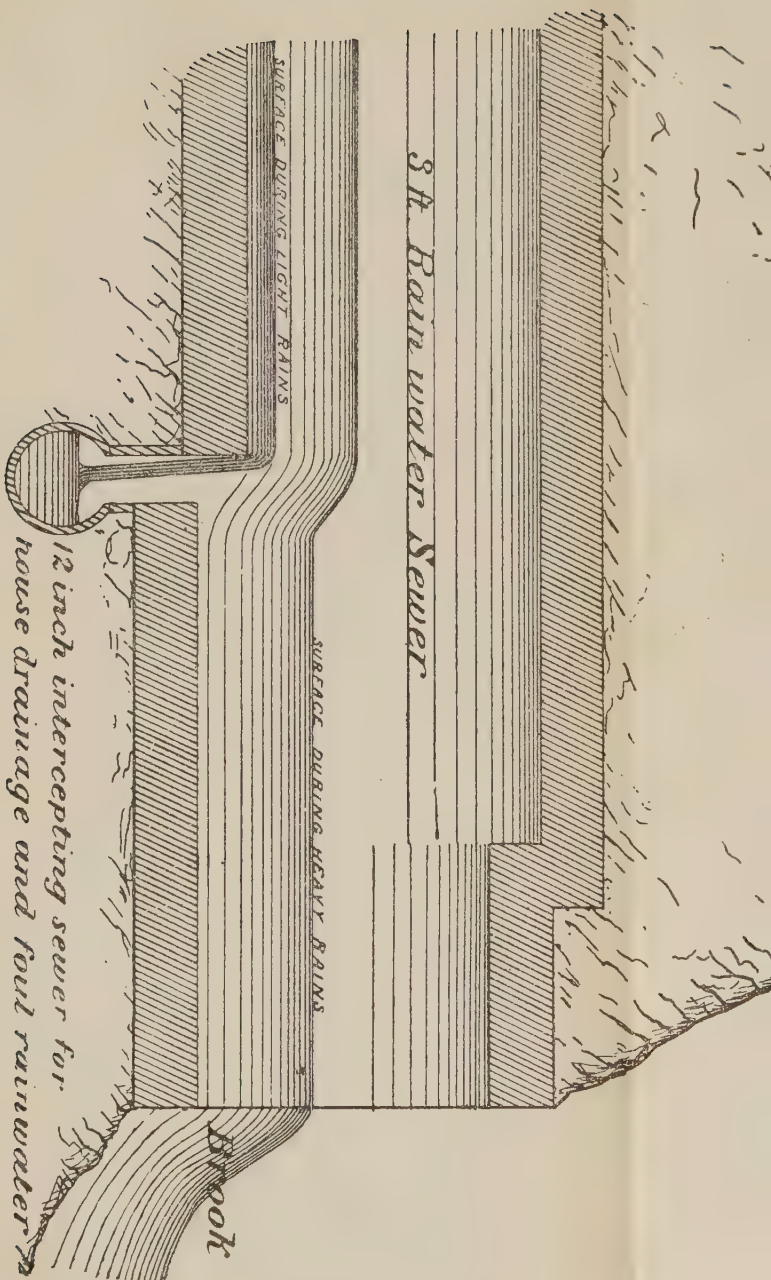
At the point where the sewers cross, an opening is made in the bed of the rain-fall sewer and also in the crown of the intercepting sewer. Knowing the inclination of the rain-water sewer, the size of the openings can be adjusted and the steps in the large sewer fixed so that any given amount of rain water may be taken into the twelve-inch sewer.

The amount that should be received into the small sewer will depend upon the pitch of the latter and its consequent capacity. During a heavy down-fall of rain, the velocity of the flow in the large sewer will be so great that none or very little will enter the twelve-inch sewer.

In very dry weather it is estimated that only three-tenths to four-tenths gallons per second flow through the present sewer, while a few days after heavy rains the quantity was only six gallons per second, or 50.4 cubic feet per minute. A twelve-inch sewer with an inclination of only one in five hundred would carry twice the latter amount.



St. Paul Water Sewer



By the arrangement described, all contaminated waters would be excluded from the brook, and it would cease to be a nuisance to the residents of Mt. Vernon, while the outlet could for many years to come be used for the sewage of all that portion of the village that will need provision for its disposal, after the necessary laterals are provided.

Very respectfully,

HORACE ANDREWS, JR., C. E.

ALBANY, *January* 31, 1885.

MARITIME SANITATION AT THE PORT OF NEW YORK

Maritime sanitary regulations at the port of New York have necessarily two important subjects for consideration.

First, the protection of the public health ; second, the preservation of its financial interests by the least possible embarrassment of its commercial enterprises.

A superficial view of the measures for the security of the one, and the conditions which appear to be desirable for the prosperity of the other, discovers an apparent antagonism between them. But sanitary regulations wisely enacted, and judiciously executed by the health authorities that guard the approaches of disease from the sea, or those who seek to restrain its development among the crowded populations of seaboard or interior communities, tend to promote the highest prosperity of every enterprise and industry.

That system of maritime sanitary regulations is most perfect that protects the public health with the least injury to vested interests and commercial enterprises. Sanitary laws, enacted by the State or general government, or ordinances and regulations established through powers delegated to municipal organizations which impose such restrictions on the commerce of a port as to practically prohibit intercourse with infected ports, can scarcely be considered as among the triumphs of modern sanitary science.

A knowledge of the laws which govern the development and progress of infectious and contagious diseases, and of the measures which observation and experience have shown to be necessary to insure the safety of the public health in the past, it is believed can be so systematized and administered that disease will be excluded without serious embarrassment to commercial interests.

The port of New York and its contiguous cities have a commerce that extends to all the ports of the world, and by interior lines of communication is connected with millions of people scattered over a vast territorial area. It has a population that exceeds any other

on the western continent, and a geographical position that renders it liable to the introduction of various forms of contagions in their latent condition. These combine to make the port of New York the most exposed to, and for the same reasons the most important to protect from, the diseases that approach by the sea.

Early in the history of the State, these facts did not escape the observation of those whose duty it was to make provision for the protection of the public health. Liberal appropriations have been made by the State Legislature from time to time to secure advantages for a successful administration of quarantine at this port, until they exceed in completeness any others in the world. The authorities upon whom such provision depended rightly judged that the preservation of the public health was secondary to no other consideration, and that, independently of the sacrifice of the human life and the suffering of the sick, the financial loss which would result to the commercial communities at the port of New York by the admission of a contagious or infectious disease which should become epidemic, would exceed the total cost and maintenance of the New York quarantine from the beginning.

The opportunity for experience and observation afforded by the conditions referred to, furnishes evidence of the efficiency or imperfection of whatever measures have been adopted for the protection of the public from such disease.

The defects which exist in the laws which govern the quarantine in this State, and consequently in its measures, are such as to render it impossible for the health officer to prevent certain forms of contagious disease from entering the port.

The axiom in physics that the strength of a chain is equal only to that of its weakest link, is equally true of maritime sanitation, more familiarly known as "quarantine."

A system of "maritime sanitation" which admits of the introduction of the infectious or contagious diseases it is designed to protect the public from, is imperfect, and should be considered with reference to its improvement. The assumption that a system is complete affords a considerable degree of certainty that its deficiencies, if they exist, will not receive the consideration necessary for its improvement.

Therefore, a frank statement and full exposure of difficulties and obstacles which prevent a desirably successful administration of quarantine, it is believed, are best calculated to secure such changes as will contribute to render it most efficient.

IMMIGRATION.

The surplus populations of Europe annually invade our country to an extent hitherto unknown in the history of the world. Within a few weeks after immigrants land on our shores, they are scattered from the Atlantic to the Pacific oceans. They come in great degree from those classes and conditions in the old world most liable to diseases of a contagious character, and they too often come subjected to such conditions in the steerage of steamers as tend to develop the worst type of the disease to which they have been exposed.

From April 1, 1880, to January 1, 1885, nearly two millions of emigrants have passed into this country through the port of New York :

1880.....	327,371
1881.....	455,681
1882.....	476,086
1883.....	405,909
1884.....	321,231
Total	<u>1,986,278</u>

The crowded condition of the old world populations, and their political and economic status, is not likely to change materially in the near future; while the inducements for them to seek homes in this country is likely to be as numerous and strong for many years to come as they have been in time past. Sanitary reforms influence tardily that portion of the European population from which great numbers of the immigration is drawn. To a great extent they are the same people in manners, customs and habits who landed on our shores half a century ago. The same diseases are found hand in hand with them on their arrival at our ports as when the tide of immigration first began to reach the western hemisphere, modified, however, by the rapid transit and the improved hygiene of transatlantic passenger steamers.

Immigrants once safely disembarked at our ports, are merged in the population of the great cities or scattered through every State and Territory of the Union.

QUARANTINABLE, INFECTIOUS AND CONTAGIOUS DISEASES.

The infectious and contagious diseases which are latent among immigrants when they pass our quarantines develop along the great

highways of travel in the cities or villages where they seek a temporary refuge, or perhaps in remote hamlets in the west or north-west. In this way the forces of these insidious enemies of human life are recruited from their most prolific source—the overcrowded populations of European communities.

Of that class of diseases known as contagious or infectious, small-pox, cholera, typhus and yellow fever are alone designated as quarantinable by the laws of the State of New York. The Health Officer has no power under the law to remove other forms of disease from vessels entering the port.

Scarlatina, Diphtheria and Measles

pass on to Castle Garden with the crowd of immigrants. The seriously sick are there sent to the Immigrants' Hospital at Ward's Island, and those suffering from the milder forms of the diseases are often allowed to proceed to their destination. It will be evident that the hospitals, or quarters occupied by the sick, cannot be disinfected without removal of the sick from the vessel.

The fact that such diseases are not considered of sufficient importance to be placed within the jurisdiction of the Health Officer tends to encourage neglect in the isolation of the sick and indifference to the exposure of the well on the part of the medical officers of steamships.

The Sanitary Code of the city of New York declares "that no person shall * * * without a permit from the health department, carry or remove from one building to any other, or from any vessel to the shore, any person sick of *any contagious disease*. Nor shall any person by any exposure of any individual sick of any contagious disease, or of the body of such person, or by any negligent act connected therewith, or in respect of the care or custody thereof, contribute, or by needless exposure of himself cause or contribute to or promote the spread of disease from any such person or from any dead body thereof."

Stimulated by the advice of the State Board of Health the greater number of the local health authorities in the State have adopted measures to secure the immediate and complete isolation of the sick of diphtheria and scarlatina by their removal to contagious hospitals, or absolute quarantine within their own domicile, and the prohibition of public funerals, or exposure of the bodies of those who die of these diseases. But with singular inconsistency the laws of the State of New York, which are the sole authority of the Health

Officer at its great commercial *entrepot*, give him no authority to remove these diseases from vessels entering the port.

Sanitary authorities are not ignorant of the fact that these diseases cause a greater mortality in the United States every year than all other forms of contagious diseases.

In 1881 there were 3,410 deaths from diphtheria alone in the cities of New York and Brooklyn. It has been estimated that six per cent of the mortality from all causes arise from these diseases, and in many localities where hygienic and sanitary conditions are much better than in the cities mentioned, the fatality has been greatly in excess of this proportion.

The following table gives the number of cases of and deaths from diphtheria and scarlatina in the city of New York during the years 1883 and 1884:

	SCARLATINA.		DIPHTHERIA.	
	1883.	1884.	1883.	1884.
Cases.....	3,825	3,262	2,906	2,221
Deaths.....	744	608	1,009	1,117
Total.....	4,569	3,870	3,915	3,338

The prevalence of these diseases throughout the country, and the great mortality which attends them, call for the most energetic measures to prevent their development by excluding all known sources of contagion. That they are frequently imported with the immigrant, and scattered as far and wide as his journey extends, there is no reason to doubt.

During the past year 154 cases of contagious disease, not subject to quarantine, passed through the New York quarantine.

Authority should be given by law to arrest cases of this character at quarantine, and to disinfect not only the vessel, but all baggage liable to have been infected.

Vaccination of Immigrants.

The incubative period of contagious diseases, and the comparatively short time occupied in the passage from European ports to New York by many of the steamers that now cross the ocean will compel the sanitary authorities to police the halting places on the immigrant's

highway of travel, and lodging-houses at ports of embarkation, if complete immunity is to be realized from the contagions which they now bring to our people.

Since sanitary laws enacted by the State or National Government in respect to vessels and passengers from foreign ports are not operative until the vessel enters within the jurisdiction of the State or General Government, the punishment for neglect to obey these laws, whether it be for not properly ventilating, cleansing and disinfecting passenger vessels, for failure to provide sufficient and suitable food and water for passengers, or the still more culpable neglect to provide necessary accommodations for the sick, and protection of the well from contagion, can be inflicted only at our ports, and for violations which exist or are apparent only on arrival.

It became evident to the present Health Officer at the port of New York, early in his administration, that if our maritime quarantines would effectually prevent the importation of the contagion of that most disgusting, if not most fatal, of the quarantinable diseases, small-pox, the soil wherein it germinates, and from which it propagates, must be sterilized by *vaccinia*.

A brief history of the effort to secure that result was given in the "Report of the Standing Committee on Quarantine," in the third annual report of the New York State Board of Health.

The language of that report is so pertinent to this subject, that the repetition of a portion of it will not be improper. "It has become evident that the remedy must go beyond the quarantine of arrival and reach the immigrant at the port of departure. No law can be made by the authorities of this country which will be recognized there. It is only by imposing restrictions and penalties at quarantines in the United States, in case of the omission to take such measures for the protection of immigrants at the port of embarkation or during the voyage, as will protect the well from disease, that a remedy can be secured." The effort to protect the immigrant as well as the people of our own country by the vaccination by ship's surgeons of immigrants insufficiently protected from small-pox, has been pursued with as much energy and success as could be expected, considering the difficulties attending it.

The co-operation of the transatlantic steamship lines in securing the vaccination of immigrants at the port of departure, or soon after embarking, with the expectation of preventing the development of the contagion among those recently infected, as many are at the crowded resorts or lodging-houses at such ports, has been cheerful

and productive of good results, but not to the extent that could be desired.

As will be seen by the statistics of small-pox on vessels entering the port during 1883 and 1884, on a subsequent page, the disease has been very infrequent in view of the number of immigrants and the extent of its prevalence at some of the ports of departure.

Under existing circumstances it is impossible for the Health Officer at the New York quarantine to protect the people adjacent to the port, or along the great interior lines of intercourse from the contagion which is latent on arrival at quarantine, to a greater extent than during the past three years.

There is no law or regulation either National, State or municipal, which prescribes the interval of time at which re-vaccination shall be made. The vaccination of all "insufficiently protected" is capable of an interpretation as various as the judgment or inclination of ships' surgeons. Some have conscientiously acted upon the presumption that re-vaccination was necessary after ten years; others, when vaccination had been effected in childhood, acted upon the presumption that it should be renewed at the adult period; others, and by far the greater number, choose to believe that "once vaccinated always protected." In consequence of this, immigrants in whom the conditions are favorable in a greater or less degree, to the reception of the contagion of small-pox, upon their arrival have that disease already developed in a modified form, or it being latent, they pass into the country and it develops where it endangers the lives and health of great numbers of persons.

The prejudice created by the anti-vaccinationists in some parts of Europe is so great that many immigrant passengers object and a few persistently refuse to be vaccinated by the ship's surgeon. At quarantine they are turned over to the Health Officer with the expectation that he will punish the refractory by detention or other means. There is no law or regulation since the expiration of the tenure of power of the National Board of Health, which will authorize that officer to support the ship's surgeon in this effort to discharge an important duty, *except* in those cases where there has been exposure to small-pox on board the vessel. The consequence, as might be expected, is to subvert the discipline and influence of the medical officer among the passengers and discourage him in the attempt to examine, much more to vaccinate, the insufficiently protected.

If this system of preventing the admission of small-pox through the port is to be continued with desirable efficiency, the authority

must be given to the maritime sanitary officer to decide, or the law should definitely determine what constitutes sufficient protection from the contagion of small-pox. And the power must be given to him to arrest and detain persons not sufficiently protected who refuse to be examined and protected, until the full incubative period of the disease has expired, from the time of the last possible exposure, with just and proper compensation for expenses incident to the detention.

The time has come when every legitimate effort and measure should be employed by sanitarians, whether it be through legislation, or the cultivation among the people of an intelligent appreciation of the measures necessary to prevent the importation and lodgment of contagions which recruit the forces of those diseases that annually decimate our population.

The observation and experience obtained at this quarantine during nearly five years past afford conclusive evidence that, if the contagious diseases which now accompany immigrants are effectually prevented from passing into the country, the supervision must begin a step nearer the source, while the inspection at the gateways of ocean commerce shall continue to be vigilant in its review of the measures taken at the port of departure, and the detection of developed cases of contagious diseases.

A law which should require all immigrant passengers to be vaccinated within a prescribed period not exceeding ten years previous to departure, and providing for an inspection of intending immigrants by a medical officer attached to the staff of the United States consul would do much to aid the health authorities at our maritime ports. The inspection by such medical officer would contribute to secure compliance with the regulations of our authorities, and the report of neglect to do so, accompanying the bill of health, would enable the Health Officer at quarantine to adopt such measures as the law would authorize or the protection of the public health require.

BILLS OF HEALTH

issued by the representatives of the United States at foreign ports are as necessary to the maritime sanitary authorities at our ports of entry, as "references" or "letters of credit" in business transactions. They are certificates of character in relation to the health of a port — good or bad, according to the extent which diseases subject to the supervision of the health authorities, prevail at the port of departure.

There are few matters subject to the jurisdiction of the Health Officer in charge of our maritime quarantines that afford him greater satisfaction, or that contribute more to the intelligent discharge of responsible duties, than the faithful report of our representatives, as to the condition of health or disease at foreign ports, particularly those subject to epidemics of contagious or infectious disease.

The commercial community, particularly that portion of it engaged in shipping, or the importation and exportation of merchandise, are greatly interested in the health authorities knowing the whole truth in respect to the sanitary condition of foreign ports, since it enables those authorities to exercise greater care in the exclusion of those diseases which, given a lodgment in our sea-ports, would paralyze commercial interests and enterprise for the time being.

The facts in relation to the sanitary condition of the ports with which a great commercial emporium like that of New York is in frequent communication, enables the Health Officer to exercise intelligent discretion in the measures necessary for the exclusion of disease, which lightens or removes the burdens which a quarantine without such information would be likely to impose.

The intelligence which bills of health afford to the maritime sanitary officer in relation to the infectious and contagious diseases at foreign ports, and the communities adjacent, is in the nature of the inspections in the public health service of towns and cities, which are indispensably necessary to secure proper measures to prevent the development, or arrest the extension of disease.

Notwithstanding that "public health is public wealth" and the confession of those best acquainted from association and observation with the commerce of the port, that bills of health are necessary for the intelligent policing of ships, of passengers, and of cargoes, the Health Officer is frequently compelled to antagonize parties interested in ships, or their cargoes, whose masters have neglected or refused to bring bills of health, although the lightest penalty is imposed for the neglect. The penalty visited upon vessels from ports subject to yellow fever, and upon all vessels from European ports since their threatened invasion by cholera, has been detention for a time sufficient to disinfect them, without removing cargoes — usually but a few hours.

The authority to do this has been seriously questioned during the past year, and was the occasion of an appeal to the honorable Secretary of State. The following correspondence will illustrate to some

extent, the embarrassment attending the present situation of this department in this matter, and the necessity for such legislation as will authorize it to require the information which consular bills of health can best supply.

DEPARTMENT OF STATE,
WASHINGTON, *June 4, 1884.* }

His Excellency GROVER CLEVELAND,

Governor of New York, Albany :

SIR — Inclose herewith a copy of a note of the 2d inst., from Count Lewenhaupt, the Swedish minister at this capital, in reference to the inspection and fumigation of two Norwegian vessels, the bark “Christopher Columbus” and the bark “Henrich Ibsen,” by order of the Health Officer of the port of New York in pursuance of a circular issued by that officer on the 10th of March, 1882, a copy of which I also inclose.

With a view to answering the minister’s note, I will thank you to inform me whether these quarantine proceedings are now had in pursuance of any law of the State of New York, or rest entirely on the act of Congress of the 2d of June, 1879.

There is no doubt that the act of Congress in question expired by limitation on the 3d of June, 1883.

I have the honor to be, sir,

Your obedient servant,

FRED’K T. FRELINGHUYSEN.

LEGATION OF SWEDEN AND NORWAY, }
WASHINGTON, *June 2, 1884.* }

SIR — I have been informed that two Norwegian vessels, bark “Christopher Columbus” arrived April 17, from Maryport, England, and bark “Henrick Ibsen” arrived May 2d from Bergen, Norway, have been fumigated in New York by order of the Health Officer, not on the ground that the Health Officer had any special reason to suspect the sanitary condition of these ports, but because the said vessels had neglected to provide themselves with the bill of health, which according to the circular issued by the Health Officer’s department March 10, 1882, all vessels arriving in New York from a foreign port are obliged to carry.

As the only law mentioned in the circular is the act of Congress of June 2, 1879, called an act to prevent the introduction of con-

tagious and infectious diseases, and as I have reason to believe that this act according to section 10, expired on the 2d of June, last year, I suppose that the circular, which is still the regulation in force in the State of New York, concerning this subject, must be considered as founded on some law of the State of New York, but I should like very much to have on this point some official information, which I could communicate to my government for the benefit of Swedish and Norwegian vessels sailing for the United States.

In consequence, I beg to ask, whether there is any law of the United States prescribing that all vessels arriving in the United States from foreign ports shall on all occasions carry a bill of health, and if not, I should also feel very much obliged if your Excellency could inform me whether the above circular, of which a copy is herewith inclosed, is founded on some law of the State of New York. At the same time I beg your Excellency to accept the renewed assurance of my highest consideration.

C. LEWENHAUPT.

His Excellency Mr. FRELINGHUYSEN,

Secretary of State, etc.

The Maritime Association of the Port of New York calls attention to the following :

QUARANTINE NOTICE.

HEALTH OFFICER'S DEPARTMENT, STATE OF NEW YORK, }
QUARANTINE, S. I., *March 10, 1882.* }

The attention of passenger steamship companies and shipping merchants at the port of New York is respectfully called to the following law of the United States :

"All merchant ships and vessels sailing from a foreign port where contagious and infectious disease exists, for any port of the United States, must obtain from the consul, vice-consul, or other consular agent of the United States, at the port of departure, or from the medical officer, where such officer has been detailed by the President for that purpose, a bill of health in duplicate, which shall set forth the sanitary history of said vessel, and that it has in all respect complied with these rules and regulations.

"2. And any such vessel which shall enter, or attempt to enter, a port of the United States in violation thereof shall forfeit to the United States a sum to be awarded, in the discretion of the court, not exceeding \$1,000, which shall be lien upon said vessel, to be

recovered by proceeding in the proper district court of the United States."

The information given to the health authorities at the port of New York, through bills of health from foreign ports, is essential to the intelligent and efficient discharge of their duties.

The temporary detention of vessels that do not bring bills of health, and their treatment as vessels which are suspected of being infected with contagious or infectious disease, are considered necessary for the correction of the frequent *neglect of obedience to the law*, and the security of the port from the admission of disease. The necessity of obtaining an American consular bill of health, when there is an accredited representative of the United States at the port of departure, is particularly enjoined.

WM. M. SMITH,

Health Officer, Port of New York.

QUARANTINE, S. I., *June 11 1884.*

"HON. GROVER CLEVELAND, *Governor of the State of New York, Albany, N. Y.:*

SIR — I am in receipt of a communication from the Hon. Daniel S. Lamont, Private Secretary of your Excellency, requesting me to make answer through your office to a communication from the Hon. Frederick T. Frelinghuysen, Secretary of State of the United States, a copy of which I have the honor to acknowledge the receipt of, and also a copy of a communication of Count Lewenhaupt, the Swedish minister resident at Washington, to the Hon. Secretary of State, desiring to be informed if the regulation in force to bring U. S. consular bills of health is founded on some law of the State of New York.

The Honorable Secretary of State also desires to be informed "whether these quarantine proceedings are now had in pursuance of any law of the State of New York, or rest entirely on the act of Congress of the 2d of June, 1879."

In reply I would say that the circular issued by the undersigned under date of March 10, 1882, referred to in the communication of the Secretary of State, was based upon the regulation of the National Board of Health, approved by the President of the United States November 14, 1881. The language of that "Regulation" was

quoted in the circular because it supplied the *most* explicit authority for the enforcement of a rule necessary for the protection of the public health. But it was not the only authority, as will be more fully shown.

Bills of health have been considered necessary and required by the health authorities of this port for many years, to aid in preventing the introduction of infectious and contagious diseases from foreign ports. The communities that environ the port of New York are more exposed to the infectious and contagious diseases that approach by the sea than any others in the United States, owing to its great commerce and thereby frequent communication with all parts of the world, the vast immigration that flows through it, and its situation within the "yellow fever zone." That a bill of health is considered essential to the efficient discharge of the duties of the Health Officer of the port of New York is evident from the language of the statute of New York passed April 29, 1863. The second subdivision of section 27 of that act declares, that it shall be the duty of the Health Officer "to board every vessel subject to quarantine or visitation by him, as soon as practicable after her arrival between sunrise and sunset, to inquire as to the health of those on board, and the condition of the vessel and cargo, *by inspection of the bill of health*," etc. Section 16 of the act mentioned declares that, "If in the judgment of the Health Officer a vessel require it, he may order the following sanitary measures." Among the measures enumerated are "the complete purification of the vessel in all her parts, by the use of steam, fumigation," etc., etc.

Section 37 of the law passed April 29, 1863, declares "It shall be the *duty* of the Health Officer, in the presence of immediate danger, to take the responsibility of applying such additional measures as may be deemed indispensable for the protection of the public health."

Early in the year 1882 in upwards of two hundred localities in the Western and North-Western States, small-pox had developed within a few preceding months, which was directly traced to contagion disseminated by immigrants who, in most instances, had passed our maritime quarantines before the disease developed.

At the present time, and for many months past, the contagion of cholera has stood on the threshold of European communities as it has done in every instance in time past before it invaded our country. These conditions were considered sufficient warrant for the Health Officer at the port of New York "to take the responsibility of ap-

plying such additional measures for the protection of the public health as bills of health may be able to afford."

It is *essential* to the intelligent discharge of the duties devolving on the health authorities at the port of New York, that they should have such information as to the health of *all* foreign ports as the consuls of the United States can give.

The Hon. Secretary of State of the United States in the communication which I have the honor to acknowledge informs your Excellency that "there is no doubt that the act of Congress in question expired by limitation on the 3d of June, 1883." I beg leave to say that I do not understand that there has been, or is any question that the power of the National Board of Health to *make* rules and regulations in relation to sanitary matters which, when approved by the President of the United States, has the force of law, expired by limitation June 3, 1883. But that the ordinances created by the board during the tenure of their power were repealed by the expiration of the time to which the power to make such ordinances or "regulations" was limited, was not the understanding or the belief of the undersigned. The question arose in the early part of the present year as to the present legal force of the regulations created by the National Board of Health. The counsel sought by the undersigned to determine whether he should consider that the rules promulgated by the National Board were repealed by expiration of the time to which its powers were limited, was conflicting. In this condition of uncertainty as to the legality of the regulation of the National Board of Health quoted by this department in a circular dated March 10, 1882, a communication, of which the following is a copy, was forwarded to the Solicitor of the United States Treasury :

QUARANTINE, S. I., *March 24, 1884.*

Solicitor of the Treasury :

DEAR SIR — There is a question with the shipping merchants of the port of New York as to the right of the Health Officer to require of vessels from foreign ports United States consular bills of health.

Will you have the kindness to inform me if there is any law making this obligatory on masters of vessels since the expiration of the "act of June 2, 1879, in relation to the National Board of Health."

If the regulation requiring masters to bring consular bills of health *is not a law*, and there is no other provision in the national

statutes whereby they can be secured, it is very much to be regretted.
An early reply will much oblige

Yours truly,

WM. M. SMITH,

Health Officer, Port of New York.

After waiting some time for an answer and receiving none, the following communication was addressed to the Attorney-General of the United States.

QUARANTINE, S. I., *April 7, 1884.*

BENJAMIN H. BREWSTER, *Attorney-General, Washington, D. C.:*

SIR — Messrs. Henderson Brothers, agents at the port of New York of the “Anchor Line S. S. Co.,” object to the regulation at this port requiring merchant vessels to bring U. S. consular bills of health from foreign ports.

The regulation referred to is based upon the act of Congress of June 2, 1879, enlarging the powers and duties of the National Board of Health, established by act of March 3, 1879.

The agents referred to claim that the expiration of the four years to which the enlarged powers and duties of the board were limited, and which expired June 3, 1883, repealed the law which required “merchant vessels from foreign ports where contagious and infectious diseases exist” to bring U. S. consular bills of health.

Please inform me at the earliest time possible whether the regulation requiring such bills of health is still in force, or was repealed by the limitation of the powers of the National Board of Health expressed in the last section of the act of June 2, 1879.

I wrote some time since to the Solicitor of the Treasury, but have received no reply.

Very respectfully,

WM. M. SMITH,

Health Officer, Port of New York.

The following reply was received :

WASHINGTON, D. C., *April 15, 1884.*

SIR — The law creating the office of Attorney-General makes it his duty to answer questions of law only when propounded to him

by the President, or the head of some executive department. It would be inconsistent with my duty to reply to the numerous inquiries which come from other sources. To say nothing of the expenditure of time, it would be committing me beforehand upon points which might afterward arise in the regular course of administration. When you take this simple view of the subject, I am sure you will excuse my not giving an opinion upon the subject to which you refer in your note.

Very respectfully,
BREWSTER,
Attorney-General.

To Dr. Wm. M. SMITH,
Health Officer, Port of New York.

Soon after the above letter from the Attorney-General was received a communication was addressed to the Hon. Charles F. Elwell, president of the Maritime Exchange of New York, as one of the most influential of the representatives of the commercial interests at this port, requesting him to secure from an authoritative source an opinion concerning the present legality of the regulation of the National Board of Health in respect to bills of health.

The failure of the undersigned to secure an authoritative opinion as to the present legal status of the "regulation" established by the National Board of Health is for obvious reasons to be regretted; but the necessity for bills of health under present circumstances will be apparent to every impartial person; and I desire to assure your Excellency that if there had been no authority under the General Government to require bills of health, the necessity would have been so apparent to the undersigned that such bills would have been required of vessels "entering foreign" at this port, under the discretionary power given the Health Officer of the port by the laws of the State of New York, "to take the responsibility of applying such additional measures as may be deemed indispensable for the protection of the public health."

The importance of bills of health at this port is frequently illustrated by occurrences like the following: The steamship "Moravia" arrived at New York, March 27, 1884, from Hamburg, at which port the steamer took immigrant passengers. The day after the

arrival of the steamer one of the passengers was taken sick with the contagious disease known as typhus fever; many other cases rapidly developed among the immigrants from the "Moravia," who had stopped in New York, or were directly traceable to the contagion brought by them. The resident physician of the hospital to which the patients were taken was one of the victims of the disease. The United States consular bill of health from Hamburg showed that typhus fever existed in that city. The managers of the line were informed by the Health Officer at this port that measures should be immediately taken to police the lodging-houses and other places of resort for immigrants where the contagion of this disease was most likely to exist, or, failing to do this, vessels from Hamburg would be likely to be quarantined on arrival at this port, for observation and disinfection. This information was given to the German consul at New York, and by him transmitted to the authorities at Hamburg. Without bills of health from Hamburg it would have been impossible to discover the source of the contagion in this instance with any certainty, or to have contributed to its destruction.

The bark "Golden Fléece" arrived at this port from Demerara September 2, 1881, without a bill of health; this port is subject to epidemics of yellow fever at certain seasons; and although no evidence of its existence at that time had been received, the Health Officer, acting under the discretionary power referred to, ordered the vessel to be discharged of its cargo "in quarantine," believing that the public health was better protected by treating the vessel as if it was infected, than to give *pratique* upon an uncertainty. It was subsequently ascertained, by confession of the master of the vessel that yellow fever prevailed in Demerara when the bark left that port, and he preferred to try his chances to pass the New York quarantine without a bill of health to taking one that was not clean.

The authority conferred by the laws of New York in respect to sanitary measures is largely discretionary with the Health Officer. Rather than prosecute in the Federal courts, and oppress the masters of vessels with the fine provided by the law for those who fail to comply with its requirements, vessels that have not brought bills of health have been treated as those are that come from infected ports, to-wit: by "fumigation." As in the case of the vessel from Demerara referred to, it is assumed that the failure of the master to bring an official representation from the port of departure of the existence, extent of prevalence, or non-existence of infectious and

contagious diseases affords reason for suspicion that such diseases exist. It will be apparent that to require bills of health only when diseases of the character named are *known* to exist, would in most instances be to exercise the vigilance too late for protection of the public health. The financial interests involved in the commerce of a port invariably prompt the concealment of the existence of quarantinable diseases. Nor would it be possible to discriminate intelligently at all times in favor of certain ports, though they are usually healthy. The community that at one time is quite free from diseases of an infectious or contagious character is liable at another to epidemics of that class of diseases.

It is the aim of modern sanitary science to trace disease to its origin, and destroy its source. And it is by the aid of bills of health, that vigilant health officials at our maritime quarantines are able to contribute in an important degree to secure that result, by protecting the seaboard and interior communities from infectious and contagious diseases that approach by the sea.

I have the honor to remain

Your obedient servant,

WM. M. SMITH,

Health Officer, Port of New York."

The total number of foreign vessels that entered the port of New York, and were inspected by the Health Officer or his deputies in 1884 was 6,035.

The number of vessels that arrived from southern ports during the season vessels from such ports are subject to inspection was 2,051.

The total number inspected during the year was 8,086.

There were 184 cases of contagious and infectious diseases found on board vessels on arrival at quarantine.

The number of deaths from all causes on board of vessels that entered the port was 260.

The number of births in transit was 143.

The following table will show the number of passengers that arrived at the port of New York on each of the steamship lines, the number of deaths, and the ratio of deaths per 1,000 :

NAME OF STEAMSHIP LINE.	Total number of immigrants.	Number of deaths.	Ratio of deaths in 1000.
North German Lloyd.....	65, 558	66	1.01
Hamburg American Packet Company.....	56, 181	58	1.03
Red Star Line.....	22, 542	12	.54
White Star Line.....	22, 287	10	.49
Inman Steamship Company.....	20, 162	6	.30
Caar Line.....	14, 508	26	1.79
Anchor Line.....	21, 815	13	.60
Liverpool and Great Western S. S. Company.....	13, 890	2	.14
National Line.....	15, 516	5	.32
Cunard Line.....	11, 909	7	.59
State Steamship Company.....	9, 215	5	.54
Thingvalla Line.....	7, 498	3	.40
Netherlands American Steam Navigation Co., Rotterdam.....	5, 153	3	.58
Netherlands American Steam Navigation Co., Amsterdam.....	5, 065	15	2.96
Bordeaux Steam Navigation Company.....	1, 010	..	.....
White Cross Line.....	551	1	1.81
Monarch Line.....	3, 450	1	2.9
I. and V. Florio Steamship Company.....	2, 710	3	1.10
Fabre Line.....	2, 695	1	.371
Great Western Steamship Co.....	320	..	.....
General Transatlantic Company.....	17, 154	7	.41
Miscellaneous.....	1, 618	3	.19

Small-Pox

has been the one above all others of the quarantinable diseases that has been the most frequent and most difficult to prevent developing after the immigrant has mingled with our population. A disease so loathsome in its effects and so fatal in its result, and yet so certainly preventable by the use of means not difficult to secure, or dangerous to the life or health of those who avail themselves of it, warrants the most energetic efforts to arrest it, and, if necessary, coercive measures to secure the employment of necessary preventative treatment.

The time has come when the teachings of experience and observation are so plain to the people in respect to the causes and prevention of this disease, that they are willing to submit to any measure which sanitary authorities concur in recommending for the extinction of this scourge.

During the past four years the sanitary authorities of the port of New York have given their best efforts to the means for preventing the infection of passengers from European ports, with the contagion of this disease.

At some one or more of the great focal points of departure for immigrants the disease has been very prevalent during the whole period mentioned; considering this fact and the large immigration that has entered the port, the result is very gratifying. But that result is less satisfactory than it should be. It cannot, however, be more satisfactory without the aid of such sanitary legislation as suggested on a previous page.

The objections, and sometimes resistance to vaccination which are met with among immigrant passengers indicate a considerable skepticism in European communities, more particularly among English people, as to the protection afforded by it; or else a fear that constitutional diseases will be introduced by that means. The groundless character of the fear that disease will be communicated by vaccination, when proper care is used in the selection of the vaccine virus, has been too often demonstrated to require any argument in this place. The result of the teachings and influence of the anti-vaccinationists is well illustrated by the fact, that in the hospitals of the city of New York, not a single case of small-pox exists at this time, while in the city of London, the reports have shown for months past an average of upward of eleven hundred cases in hospital. In New York city, where a "from house-to-house" inspection and search among the tenement population for the unvaccinated is practiced every year, not a case of small-pox has occurred for a year past, except as it was imported and developed by persons from other localities; in London, the weekly average of new cases as indicated by bills of health and the number in hospitals has been from four to five hundred.

The number of cases of small-pox on vessels that entered the port in 1883 and 1884 was twenty-five.

Among the cases of small-pox that developed on ship-board during the passage to this port during the years 1883 and 1884 the following are considered deserving of a brief record in this place, as illustrating some of the many peculiarities of the disease, and the difficulty of preventing the extension of the disease on a passenger steamer and among the people with whom the immigrant mingles after he enters the country.

February 9, 1883, the steamship *Elbe* arrived with 682 immigrants. One case of small-pox, a child of one year, was found in hospital. Assurance was given by the ship's surgeon that the patient had been isolated from the beginning, in a room in an unoccupied steerage. The father, mother and three other children, all of whom had satisfactory evidence of previous vaccination, it was said, had been kept in the room with the patient, or a room adjacent to and communicating with the sick room. All the parties referred to, with their clothing and bedding, except what was burned in the steamer's furnaces, were removed to the contagious hospital. The passengers and crew were vaccinated, except ninety-one who had been vaccinated successfully by the ship's surgeon during the voyage, the hospitals disinfected and the steamer allowed to proceed.

On the 19th of the same month, Frederick Kaat a steerage passenger on the *Elbe* who had been lodged in Raymond Street jail (Brooklyn) was taken sick with small-pox.

The period between the arrival of *Elbe* and the development of the disease in Kaat was too short to allow the belief that he contracted it after landing. The only reasonable conclusion is that the man contracted the disease by his visit to the hospital, or more likely, by some of the friends of the patient being allowed to leave the room in which they were isolated with the sick, conveying the contagion to him in their clothing. In those instances in which the isolation of the patient has not been as early or complete as it should have been, the temptation to conceal the fact from the quarantine officer is exceedingly great, as the medical officer generally loses his position, when the detention of the vessel, or any considerable expense, is the consequence of the discovery of his neglect.

The steamship *Ptolemy* from Rio Janeiro, February 4th, arrived at quarantine the 28th of the same month. One of the crew was sick of small-pox in an advanced stage of development. The surgeon declared the case was immediately isolated, in the apology for a hospital near the fore-castle, and separated from it by the forward bulk-head where the patient was found when the steamer arrived.

A day or two after the development of this case, two other men of the crew were taken ill and were put into the same room with the patient, under the apprehension that they were suffering from the initial stages of small-pox. After several days' detention in the same room with the case of small-pox, their ailment was found to be of a trifling character, and the captain of the steamer ordered them to duty without reference or deference to the medical officer.

When the Health Officer at quarantine reproved the surgeon for allowing the men to return to their quarters, and mingle with other portions of the crew before their clothing had been disinfected, he was told that the captain would not be advised by him, but peremptorily ordered them to immediate duty. Two days after the arrival of the *Ptolemy* another of the crew developed small-pox, and on the third day, two others were removed to hospital with the same disease. It is evident that the men who were put into hospital under the mistaken impression that they were ill with small-pox, and who had been ordered to duty without the disinfection of their clothing, had conveyed the contagion in their clothing from the hospital to other members of the crew. A lesson was in this instance taught the master of the *Ptolemy*, though it was expensive to the owners of the vessel, to-wit: That though the medical officer of a steamer may not know as much of navigation as he, he nevertheless has a duty scarcely less responsible, and which should be quite as independently exercised as his own.

The steamship *Nemesis* arrived the 10th of June, 1883, having one case of small-pox of a mild type. The patient, aged twenty-five years, had been vaccinated successfully seven years previously. The case was peculiar only in the fact that the man was susceptible to the contagion of small-pox in so short a time subsequent to vaccination.

June 15, 1883, the steamer *Celtic* arrived with 850 steerage passengers, among whom were the following cases:

Gustave Morson, aged 23 years, was ill with small-pox. The eruption was in the second day of its development. Carl J. Swenson, aged 32 years, had varioloid. He was vaccinated when twenty-four years of age, but the vaccination had produced only a slight change in the color of the skin, leaving no evidence of a depression or proper cicatrix. Hebena Swensen, aged seven years, developed varioloid on the 11th. The eruption was slight when examined at quarantine on the 15th, with an abortive tendency evident in the character of the pustules. Christina Swensen, aged six years, had scarcely more than a dozen varioloid pustules; the same abortive or premature tendency in the development of the eruption was evident in each of the cases of this family.

These children were vaccinated when infants, but the evidence of the vaccination was to be found only in a slight change in the color of the skin where the vaccination was supposed to have been effected. An extensive experience and observation similar to the

above afford very good ground for the suspicion that a vaccination which does not produce some "pitting" a (cicatrix), has not destroyed the entire susceptibility of the system to the contagion of small-pox.

The Cunard steamer *Scythia* arrived October 31 with 346 steerage passengers and 171 in the saloon. Lorenzo Ruyz, a saloon passenger, fifty-five years of age, had small-pox (*variola discreta*). The surgeon of the steamer reported that the eruption appeared the 29th inst. The patient was not isolated until the 30th. At the latter date the patient was removed from state-room No. 53, situated near the foot of the companion-way leading from the promenade deck to the dining saloon, to a hospital situated on the main deck forward, on the starboard side, and immediately aft of the sally port.

The fact that the eruption on the patient's face was noticed by some of his fellow passengers in the smoking-room the day previous to his isolation affords presumptive evidence that more or less of the passengers were exposed to the contagion of the disease.

All the saloon passengers were examined with reference to their protection by vaccination. Children under ten years with satisfactory evidence of protection, and adults who had been successfully vaccinated within ten years were passed; all others were vaccinated, believing that the exposure to the contagion was so recent that a successful vaccination would prevent the development of the contagion in those who had been infected.

Subsequently information was received from the Boston board of health that a cabin passenger on the *Scythia* had developed small-pox in that city two weeks after his arrival at this port. Inquiry was made of this man, after his recovery, to ascertain if he had been vaccinated at quarantine, or was one of those exempted from vaccination on account of his declaration that he had been successfully vaccinated within the ten years previous. No reply was elicited; for this reason and the fact that the threatened suit against the Cunard Steamship Company for \$25,000 damages was not pressed after the inquiry, there is a suspicion that, in order to escape the vaccination at quarantine, the time since his successful vaccination was greater than he represented.

Experience and observation of the comparative rapidity of the action on the human system of the contagion of small-pox and *vaccinia* have established the conviction in the mind of the writer that the introduction of the latter a day or two subsequent to the reception of the former will arrest its development; while the ef-

fect of vaccination in modifying the severity of small-pox is evident far into the incubative period of the disease.

The Italian bark *Giovannia* from Seville (Spain), twenty-seven days, passed quarantine January 5, 1884, all hands well and on duty, On the 11th the health commissioner of Brooklyn reported that a sailor from the *Giovannia* was admitted the day previous to the Long Island College Hospital with a disease which, the day following the admission, was discovered to be small-pox.

It was evident that a case of small-pox had occurred on the bark during the passage. At an interview with the master of the vessel. he evinced so much hesitation, apology and confusion, that there was no longer a doubt that not only had there been a case of the disease on board which had recovered since leaving Seville, but that he had sought to conceal the fact from the boarding officer at quarantine.

The vessel was ordered back and put in quarantine, where it was cleansed and disinfected. One of the sailors admitted he had been ill, and an examination of the man gave evidence of recent pustular disease of the skin. The captain was arrested and brought before the police court of the city of Brooklyn to answer to the charge of bringing a case of contagious disease into the city, but escaped punishment under the plea that he did not know it was small-pox, but supposed it was syphilitic disease of the skin.

Two questions are asked the master of every vessel by the medical officer at quarantine before the permit is given. "Are you all well on board?" "Have you had any sickness during the voyage?" The desire to escape the detention and expense which may be necessary to cleanse clothing, baggage and vessel affords a temptation to conceal the occurrence, or the existence of disease of an infectious or contagious character on board of vessels entering our ports, that in some instances is not resisted, and which the utmost vigilance of the Health Officer is sometimes unable to detect.

The same day that the patient from the *Giovannia* was admitted to the Long Island College Hospital, a sailor from the same vessel entered the surgical ward of the hospital, and was treated for syphilis. Three patients in the ward to which he was admitted contracted small-pox from the contagion conveyed from his clothing.

The wisdom of the law is vindicated by such instances as the above, which declares that "Any person, except a pilot, who shall go on board of, or have any communication or dealing with, any vessel hereinbefore declared subject to quarantine, before she shall be boarded and examined by the Health Officer, or while she is being

examined by him * * * shall be guilty of a misdemeanor." § 36 of chap. 358, Laws of 1863.

The steamer *Polaris* of the Carr line from Hamburg May 4, arrived at quarantine May 23 with 1,085 passengers in the steerage. The surgeon reported one case of small-pox discovered the 17th. The case was properly isolated when the vessel was examined at quarantine. But a careful inquiry among the fellow passengers of the patient revealed the fact that the disease was in the eruptive stage when discovered on the occasion of the surgeon's visit to a patient lying in the same bunk, ill of some other ailment.

The evidence of exposure of other passengers to the contagion was sufficient to warrant the detention of all on board for a time sufficient to develop the latent contagion among them, or to secure the protective influence of vaccination.

The choice was given the parties interested in the steamer to remove the passengers to, and subsist them at, Hoffman Island, or to let them remain under observation and treatment on board the steamer. They elected to do the latter. All persons on board were immediately vaccinated, and every fourth day were examined and such as gave no evidence of a successful result were re-vaccinated. After three vaccinations and failures it was assumed that the failure was on account of the protection established by previous vaccination if a cicatrix gave evidence of it. From the date of the arrival of the steamer, the 23d, to the time of her clearance, June 8th, seven cases of small-pox were removed to the contagious hospital.

The latent contagion with which immigrants not infrequently pass our maritime quarantines is very well illustrated by the following case:

The steamship *Weser*, of the North German Lloyd line, arrived June 4th from Bremen, May 22d, with 802 immigrant passengers. The surgeon of the steamer had vaccinated 762 of the passengers. Two children were reported to have died on the passage of "tabes mesenterica," and one of "measles." One case of measles was discovered on "passing" the immigrants; other than this, all were well.

Under date of July 2, 1884, Dr. H. B. Baker, secretary of the Michigan State Board of Health, wrote as follows: "Henry Stonehouse left Bremen by the steamer *Weser* May 22d and landed in New York June 4th; started for Michigan the 5th; was taken sick *en route* June 8th—had been feeling bad a day or two; reached Le Roy June 9th; called a physician June 10th." The case was

discovered to be small-pox. The day the eruption appeared is not stated; the omission of that important part of the record, and the fact that the patient "had been feeling bad a day or two" previous to the 8th, gives reason for the presumption that the disease was contracted in Bremen, and the same day that he embarked.

The only alternative is that there was a case of the disease already developed among the emigrants when the steamer sailed, from which the man was infected. Against this hypothesis is the affidavit of the captain and surgeon of the *Weser*, made at quarantine, "that no case of sickness or death from small-pox, cholera, yellow fever, ship fever, or any other contagious or infectious disease has occurred on board of his vessel while in any port or on the passage." The statements of immigrant passengers in relation to the character of the sickness that occurs among their fellow passengers have been often found to be unreliable, and in some instances where sensational stories have been told by them, they have been found to be without the least foundation in fact.

The great probability is that the case affords another illustration of contagion received by the immigrant at the port of departure, and during the incubative period he crossed the Atlantic and reached a far interior community.

The steamer *Fulda*, of the North German Lloyd line, arrived at quarantine the 4th of October, 1884, from Bremen the 25th of September, with 673 passengers in the steerage. A child, aged fourteen months, was taken sick with small-pox the day after leaving Bremen, and died the morning of the day the *Fulda* arrived at quarantine.

The surgeon of the steamer declared that the child was isolated the first day of its illness, and the day previous to the appearance of the eruption; and this was corroborated by the relatives of the child, who were also isolated in the ship's hospital with the patient, one of the stewards being detailed to wait upon the inmates of the hospital, without taking any precaution against conveying contagion by change of clothing. When the surgeon was sharply admonished for allowing such exposure of the passengers and crew, he stoutly maintained, as did the steward, that it was the only instance of its occurrence.

The passengers and crew were vaccinated; the mattresses and clothing remaining after the transfer of the occupants of the hospital were burned, the hospital disinfected and the steamer given *pratique*.

The sequel of this case is found in the following extract from a communication from the secretary of the State Board of Health of

Minnesota, under date of November 14, 1884: "A family by the name of Pile landed in New York October 4th from the Bremen steamer *Fulda*, reaching Dassel, Minn., October 9th;" * * * "one child, Fanny Pile by name, developed mild varioloid about October 15th."

This statement furnishes pretty conclusive evidence that the contagion was contracted on the *Fulda*; and if the isolation of the patient and the other occupants of the hospital was as complete as represented, the contagion was probably communicated from contagion conveyed in the clothing of the steward who was detailed to attend to the ship's hospital.

The cases above referred to in some measure illustrate the difficulties with which the maritime quarantinist must contend. The neglect, and sometimes ignorance, of medical officers of passenger steamers often contribute in a considerable measure to increase the opportunity for the importation of the contagion of quarantinable diseases.

Typhus Fever,

in the days when a transatlantic voyage occupied several weeks, and emigrants were packed like sardines in a box in the unventilated holds of sailing packets, was the most frequent and fatal of the diseases to which immigrants are subject. The rapid transit and improved hygiene of the transatlantic passenger steamers of the present day have made typhus a comparatively infrequent disease.

During the enormous immigration of the past five years, when steerages were crowded, and cases of typhus were discovered among immigrants, the source of the disease has been generally traced to crowded lodging-houses in cities at the ports of departure.

The steamer *Moravia* from Hamburg, the 14th of March, 1884, arrived at the New York quarantine the 27th of the same month with 1,466 passengers in the steerage. One child was reported by the surgeon to have died of convulsions. Nine cases of measles were found on inspecting the passengers. With this exception all on board were well. April 4, Wolf Alterman, a steerage passenger on the *Moravia*, was found by the health authorities in a tenement-house sick with typhus fever; from the statement of the patient and his condition it was evident he had been ill several days when the case was reported to the authorities. April 5, another immigrant by the same steamer was sent to the contagious hospital; this man claimed he had been sick four days; and on the 7th still another was

discovered suffering from the same disease, who had been sick seven days. Subsequently eleven other cases were discovered among those who were passengers by the *Moravia*. Eight of these immigrants had stopped at the lodging-house of one Jarmulowski in Hamburg, and three others were found to have stayed at the house of Rafael Mendel, No. 42 Muhlenstrasse. June 7, 1884, Daniel Pearlstein, a passenger by the steamer *Bohemia*, from Hamburg, May 14, was removed to the contagious hospital with well-marked symptoms of typhus. This immigrant arrived May 26, and was not taken sick until June 1; he had lodged for several days previous to sailing at the house of Rafael Mendel.

Notwithstanding the denial by the agents of the line to which these vessels belonged that typhus fever existed in Hamburg, the evidence was so conclusive from the United States consul's bills of health and the history of the above cases that these immigrants had been infected at the lodging-houses in Hamburg, that the Health Officer of the port addressed the following note to the agents of the steam-ship company :

QUARANTINE, S. I., *April 24, 1884.*

MESSRS. KUNHARDT & Co., *Agents, Hamburg-American Packet Co.:*

GENTLEMEN — There has been much complaint to me by the health authorities of New York city concerning cases of typhus fever in the city originating among passengers by the steamship *Moravia* on her last arrival at this port, the 26th ult. I believe. It is believed that the contagion was taken by them in the lodging-houses in Hamburg.

The description the victims of the disease give of the condition of the lodging-houses referred to warrants the belief that they took the disease there. If the condition of other vessels of your line from Hamburg, or of the passengers from the steamers from that port, should develop the disease mentioned, it will compel the authorities at this port to quarantine against Hamburg so far as to detain and disinfect vessels from that port with steerage passengers.

To prevent immigrants from being infected at the port of departure, I would suggest the necessity of the owners and managers of the line at Hamburg policing the cheap lodging houses at that port, to secure cleanliness and prevent overcrowding. The supervision of these lodging-houses by the managers of passenger lines is important to their interests as well as to the life and health of im-

migrants and the people of this country with whom, to a greater or less extent, they will soon mingle.

Inclosed is a list of the *Moravia's* passengers now in the contagious hospital who are sick with typhus fever and whose lodging places while in Hamburg have been ascertained; the names of the proprietors of these houses are added, to facilitate your endeavor to prevent other passengers from being infected.

Very respectfully yours,

WM. M. SMITH,

Health Officer, Port of New York.

A copy of this communication was forwarded to the German consul at New York city, and by him transmitted to the civil authorities at Hamburg.

Yellow Fever,

during the two years last past has been much less prevalent and milder in type in those localities where it prevails every year to a certain extent and with more or less severity.

At the port of New York it has made its appearance every season on vessels from ports in the West Indies or the Mexican coast from time beyond the memory of the oldest living person.

The number of cases arriving at the port of New York has differed as widely as in the localities where it is indigenous — not always in the same ratio, though, as might be expected, more or less according to its prevalence in its accustomed haunts. Climatic conditions, which at certain seasons and during some years combine to render yellow fever peculiarly virulent and much more extensive than in others, does not extend even in a minor degree to localities in more northern latitudes, although they are situated within what has often been called the “yellow fever zone.” Long continued heat, exceeding an average temperature of 75°, accompanied by considerable humidity, prevails every summer in the West Indies and on the Gulf coast of the United States. These conditions suffice to secure the rapid propagation of this disease when once the infection has obtained a lodgment. The same thermometric and hygrometric conditions, even proportionately to the difference in latitude, may not prevail on the more northern coasts of the Atlantic. The influence of conditions which prevail in the higher latitudes of the north, or which bring to the Atlantic sea-board the comparatively dry winds which have swept over the vast areas of the west and

north-west, may modify or arrest the development of this subtle exotic infection. Hence, perhaps, its less frequent appearance and less virulent type some years than others.

The exemption from this scourge which northern cities situated on or near the sea-coast have enjoyed for more than a quarter of a century, at whose ports yellow fever is more or less a visitor every year, is not wholly dependent on climatic conditions. New York and its adjacent communities have suffered from no less than seventeen epidemics of yellow fever, in each of which it has numbered its victims never less than by hundreds, and sometimes by thousands.

Better sanitary conditions on vessels and in our sea-board cities, and more than these, the improved quarantine regulations, which, while not increasing, but essentially lessening the burdens of commerce, have sought and discovered the lurking places of the disease on ships, and by measures no more mysterious than the art of cleansing, or more difficult than the use of agents which destroy the infection, have contributed for more than a quarter of a century to secure the dense population that surround the port of New York from an epidemic visitation of this scourge of tropical latitudes.

The infection once given a lodgment at any of the sea-port towns on the Atlantic coast during the season when there is a mean temperature of 75° during the day, will doubtless develop and extend its area, but with a rapidity and intensity proportionate to other favoring circumstances, such as humidity and general unsanitary conditions.

When high cool winds prevail for a few days in the latitudes where the disease habitually exists, there is a noticeable decrease in the number of its victims. The history of yellow fever in this and other countries justifies the opinion that the extension of the disease to interior localities, whose altitude is five hundred feet above the sea, is prevented by the fact that the atmosphere is cooler and drier than that which prevails on the borders of the ocean or near the mouth of its great tributaries.

The exemption from yellow fever which climatic influences have afforded during the past year on the Atlantic sea-board may be so essentially changed the ensuing, or any future season, as to supply all that is necessary for a development of the disease to epidemic proportions, if the infection once obtains a lodgement. Measures that are uniformly efficient, and vigilance that is unceasing in discovering the necessity for their application, is the price of success in preventing the introduction of yellow fever at the maritime quarantines.

within the "yellow fever zone." The following table will show the number of vessels from ports liable to yellow fever, and which to secure more complete isolation are first examined in the lower bay.

REPORT of Lower Quarantine for 1884 (from July 3 to October 8).

INFECTED PORTS.	Number of vessels arriving during the period of infection.	Number of vessels with sickness.	NUMBER OF SICK.			NO. OF DEATHS.		
			In port of departure.	On the passage.	In quarantine.	In port of departure.	On the passage.	In quarantine.
Havana	44	3	1		2			
Rio Janeiro.....	1							
Georgetown, S. C.	1	1			4			2
Aspinwall.....	8	2		3	3		3	
Chillipee.....	1	1			1			
Santiago de Cuba	7	2	3	2	1	2	3	1
Nuevitas	1	1			1			
Calcutta	1	1		33			31	
Jacmel	1	1			1			
Port Limon.....	3	1			1			
St. Kitts	1	1			1			
Porto Bello.....	1	1			1			
Bocas del Toro, U. S. C.	1	1	1		1			1
Savanna La Mar	1	1		2	1		1	
Bathurst, Africa.....	1	1		5				
	99	18	5	50	19	2	33	4

Cholera,

commenced its deadly march from its home in India three years ago.

When it made its first halt at Aden on the Red sea in 1882, it was apparent to many observers, that one of those mysterious cycles in the development of its forces had been completed, and thenceforth it would move steadily forward until the great centers of population in Europe and America had been reached. So impressed was the New York State Board of Health with this probability that at one of its regular meetings of that year a warning cry was raised by an appeal to the National Board of Health.

It was evident that the enemy had determined to try conclusions with the new generation that had arisen in the countries it had formerly invaded. In June, 1883, it invaded Egypt finding in the extremely unsanitary condition of *Damietta* an opportunity to recruit its forces, and commence its march.

Its progress in Egypt need not be recited. It is asserted that the first victim at Toulon, July 4th, was not reported. *It is certain* that the fourteenth day of June, 1884, it had already landed upon

the Mediterranean coast of France and secured its first victims at Toulon. Thenceforward its march through the devoted city was one of destruction.

June 28th it was officially announced that the dreaded scourge had reached Marseilles, and six deaths were scored at noon of that day. The worst that had been feared, when the disease was recognized at Toulon, speedily came, and the scene was such as only an epidemic rapid in its development, and fatal in its results, can produce. The prefect estimated on the 16th of July, that 70,000 people had fled from the city. Commerce and industry were at a standstill, and want and misery stared in the face those who remained, because they had no employment, and no refuge to flee to. The suburban population and the towns and villages throughout the greater part of the south of France were invaded before the beginning of August.

A rigid *cordon sanitaire* was drawn by the Italian authorities on the boundary of Italy contiguous to Switzerland and France. Notwithstanding, in ten or twelve of the communes of Rome cholera was reported the 1st of August, and August 5th it was known to have appeared in several towns in the interior of Italy. At Naples the unwelcome visitor was announced the 26th of August; and although great numbers of the people fled from the plague-stricken city, reducing the population many thousands, yet in the twenty-four hours preceding the 10th of September there were 365 deaths, and 937 fresh cases of cholera in the city.

No city in Europe was better prepared by the presence of filth at the wharves and docks, filth in the streets, and filth in the houses of the lower classes of the people, to revive the waning vigor and virulence of the disease than Naples. One-third of all that were seized with cholera died.

The exhausted energies of the disease in France seemed to revive when it appeared in Paris in the early part of November of last year. November 11th ninety-seven new cases were reported. But the disease was confined to the lower and more filthy portions of the city, and did not at any time assume the virulent and fatal type that it had in many other localities.

The question which has been most frequently asked during the past year, of those whose professional intelligence entitled their opinion to consideration, is, "will cholera reach this country the ensuing spring or summer?" A question which it has been difficult to answer with satisfaction to the querist or the queried. If "like causes

produce like effects" in every instance, there is good reason for the belief that cholera will reach the Western Continent at some point on its extended sea-board, where commercial intercourse with the countries already infected shall afford the opportunity.

In the five invasions of Europe by this disease during the present century, it has succeeded in every instance in reaching our shores and developing into epidemic proportions.

If the epidemic of this disease which has prevailed in Europe during the past year is to be an exception to the experience of the past, in respect to its invasion of our country, it must be through the use of means more effectual than those employed on other occasions, or the exercise of greater vigilance, or both.

Modern sanitary science is in some measure on its trial in the effort to arrest the progress, and, if it cannot do that, modify the severity of this disease, which has already extended over a considerable portion of Continental Europe.

The development of cholera at the French ports of Toulon and Marseilles required the immediate adoption of increased vigilance at our maritime quarantines.

Accordingly at the port of New York all French mails, baggage and merchandise, whether by French or English steamers, were disinfected with sulphurous acid gas. When the epidemic reached Italy, the regulation was applied to the same articles from Italian ports.

The following circular was issued and distributed among the transatlantic passenger steamship lines trading at this port :

CIRCULAR.

To Owners, Agents, Masters and Medical Officers of Passenger Steamers :—

The apprehension which exists in relation to the approach of Asiatic cholera to the ports of the United States, and the well-grounded fear of its introduction among the people of this country, have determined the undersigned to again appeal to those interested in and in charge of transatlantic passenger steamers, to exercise unusual vigilance in the detection and management of cases of the disease should they develop among the passengers or crews under their supervision, and in securing the best possible sanitary condition of the passengers and vessel during the voyage.

In the five epidemics of this disease which have invaded this country, its introduction has been heralded by the approach of the sick of cholera to some port or ports of the North American continent.

It is believed that the conditions upon which the propagation of this disease depends, and the measures necessary for the destruction of the contagion which attends it, are sufficiently understood to arrest the one, and secure the other, by the exercise of proper vigilance and intelligence. Modern sanitary science is in some measure on its trial in the effort to prevent the introduction of cholera, and its speedy destruction should it secure a lodgment.

The surgeons of passenger steamers are earnestly desired to contribute by every necessary effort to the successful result of this trial. The lives and health of many under their charge will depend on prompt and intelligent action should cholera develop on the vessels of which they are medical officers, and the line that has intrusted important interests to their care, will be served or jeopardized according as they are more or less vigilant.

To the end of preventing the development of cholera during the voyage, or its spread among passengers and crew should it develop among them, it is important that the following precautions should be observed:

QUARANTINE OF INTENDING IMMIGRANTS.

First. That all immigrant passengers from a cholera-infected port, or district of country, be required to remain at a quarantine of observation for eight days before embarking on their journey from such infected place inclusive, and their baggage in the mean time subjected to proper disinfection.

MEDICAL INSPECTION.

Second. The inspection of all steerage passengers twice in each twenty-four hours by a medical officer of the ship.

ISOLATION OF THE SICK.

Third. The immediate removal to well isolated hospitals of all persons having *choleraic symptoms*.

Fourth—a. The disinfection of rooms or quarters vacated by the sick, by the combustion of two pounds of sulphur to every ten cubic feet.

b. The ejecta and dejecta of the patient should be received into vessels containing either of the following disinfecting solutions:

Bichloride of mercury 1 to 1000—(1 oz. to 8 gallons of water); Sulphate of iron, 2 lbs. to 1 gallon of water; or sulphate of zinc, 1 oz. to the gallon.

c. The daily use of one of these disinfecting solutions in cleansing all closets and lavatories.

d. The destruction of all clothing used by the sick, or disinfection of it by prolonged immersion in boiling water, or one of the above-mentioned solutions.

WATER AND FOOD SUPPLY.

Fifth. The water used for drinking should be free from the suspicion of pollution; fruits and vegetables should be used only when cooked, and all food should be freshly prepared and well cooked.

VENTILATION AND CLEANLINESS.

Sixth. Crowd-poison in the atmosphere of the steerage, and uncleanliness of its occupants, are conditions which favor the development, and increase the severity of all forms of contagious and infectious diseases. Therefore, the port-lights should not be closed except during very heavy weather, the passengers should be compelled to vacate the steerage frequently, and take the fresh air upon the main deck, thus affording opportunity for thorough ventilation, while frequent baths or ablutions should be urged upon all.

Very respectfully,

WM. M. SMITH, M. D.,
Health Officer, Port of New York, U. S. A.

Jan. 6, 1885.

DISINFECTION OF OLD RAGS.

The disinfection of old rags from cholera-infected ports, or those gathered in countries infected by the disease, and the subsequent extension of the order by the United States government, for the disinfection of *all* rags entering the ports of the United States, have become of so much interest as to warrant a brief notice in this article.

Early in June, 1883, the suspicious disease that had made its appearance at Damietta (Egypt) the preceding month reached Cairo and Alexandria, and was clearly recognized as Asiatic cholera. The apprehension that the contagion would reach New York through infected merchandise, particularly in old rags, of which upward of five thousand tons were annually imported, a considerable portion of which passed into the country through this port, induced the Health Officer at the New York quarantine to issue the following circular:

“To prevent unnecessary loss or detention of cargoes of rag which may be shipped to this port from European ports, or from ports in the British Isles, and to enable the health authorities to discriminate between cargoes or portions of cargoes of this kind that are suspicious of being carriers of the contagion of cholera and those which are not, the Health Officer at the New York quarantine will require of all consignees or owners of rags an affidavit made by the shippers before the United States consul, vice-consul or commercial agent at the port of shipment, that each and every bale in all invoices are “domestic rags” and are not reshipments; or, in case such cargo is a reshipment, the affidavit must explicitly state the port from which they were originally shipped.

It is respectfully suggested to whom it may concern that much embarrassment and perhaps loss may be prevented by the immediate communication of this regulation to correspondents at the ports referred to."

WM. M. SMITH,
Health Officer, Port of New York.

The above circular was practically an embargo on the admission of old rags from Egypt, at the port of New York. The accumulation of this article in the warehouses at Cairo and Alexandria came to be so considerable, and the anxiety so great on the part of the owners and consignees to bring them forward, that a plan for their disinfection at the warehouses in Egypt was formulated by the Health Officer at New York in September, 1883, and submitted to other quarantine authorities; the plan embraced the following requirements.

"1. Before baling the rags, thoroughly separate and distribute them upon racks not more than four inches thick, each tier of racks to be two or more feet apart. Disinfect by burning not less than two pounds of roll sulphur in a close shut room 10x10 feet and ten feet high; or in that proportion. The room should be closed for six to ten hours; or,

"2. Subject the rags to boiling water for at least two hours under a pressure of fifty to sixty pounds; then dry on racks as when prepared for disinfection. A rotary boiler may be used for this purpose, in which several thousand pounds of rags may be put at one time."

"The latter method is believed to be free from some of the objections to which the disinfection by sulphur is open; for instance, the liability not to separate the rags thoroughly when put on the racks, but leaving them matted together, while this method will be equally efficient in securing the destruction of any infection which may exist in the rags."

"To give confidence to sanitary authorities in this country, a capable and conscientious inspector, who shall be indicated by some sanitary official or body, should be appointed to superintend the disinfection of rags at Alexandria and Cairo. The certification of such an inspector should accompany each and all invoices, that they have been properly disinfected, and every bale should be stamped "inspected by (name of inspector)."

Subsequently it was decided that the Secretary of State of the United States should be requested to appoint an inspector who should be a citizen of the United States, and whose invoice should be indorsed by the Consul-General at Alexandria.

In compliance with the request, an inspector was appointed by the Secretary of State who proceeded to Egypt, where the Seymour Paper Company had already made a plant costing several thousand dollars.

The adjournment of the Forty-eighth Congress without making an appropriation for the maintenance of a Consul-General in Egypt induced the Secretary of the Treasury to issue the following circular :

TREASURY DEPARTMENT,
WASHINGTON, D. C., *July 19, 1884.* }

To Collectors of Customs and others whom it may concern :

The following letter to this department from the Secretary of State, dated July 19, 1884, is published for your information and guidance :

On the 16th of April last I had the honor to inform you that a method of disinfection for rags had been agreed upon by the health authorities of New York, New Haven, and Boston, and that an inspector had been appointed who was to act under the Consul-General at Cairo, who was also to authenticate the certificate of inspection.

Congress having failed to provide for a Consul-General at Cairo, such certificates cannot at present be furnished.

The Consul-General was officially charged with the duty of seeing that the rags were disinfected, and as his office no longer exists, the want of satisfactory evidence of the fact of disinfection makes it necessary to abandon, for the present, the plan agreed upon. I have, therefore, revoked the appointment of the inspector, Mr. McNally, and any others designated as inspectors.

Because of the condition of things thus presented, you will, until further orders, prevent the unloading of rags from infected foreign ports, and of rags which are suspected on good grounds of being infected from any foreign port.

CHAS. J. FOLGER,
Secretary.

Under date of August 30, 1884, the acting Secretary of State, Charles E. Coon, notified " officers of the customs and others inter-

ested, that the unloading of old rags arriving at ports of the United States from foreign ports, on and after the first *proximo*, is prohibited for three months after date."

This order found many cargoes, probably not less than \$100,000 in value, afloat *en route* to the port of New York.

The order was subsequently "modified" by allowing the admission of rags "afloat" at the date of the order; and under date of October 31st, it was further modified by Secretary Gresham "so as to limit it to infected ports only; and all Mediterranean ports are deemed infected ports within the meaning of this order; provided, however, that no old rags shall be landed at any port of the United States except on a certificate of the United States consular officer at the port of departure, that such rags were not gathered or baled at or shipped from any infected place or any region contiguous thereto."

The Secretary of the Treasury, in the above order, formulated substantially the same regulations for the admission of rags at ports of the United States, that were issued by the Health Officer of the port of New York, in the circular published August 1, 1883.

At the conference of the representatives of State Boards of Health, and the municipal Health Organizations held at Washington the 10th and 11th of December, 1884, the disinfection and admission of old rags from foreign countries became a subject of considerable discussion.

The committee on Federal Legislation appointed by the conference was invited by the Secretary of State, and the Secretary of the Treasury, to confer with them in relation to regulations for the admission of old rags from foreign countries into ports of the United States. The public apprehension had become very great, that the contagion of cholera would reach our people through their admission without disinfection. This apprehension was unnecessarily increased by sensational articles in the press which dilated upon the danger in terms which were well calculated to inspire a fear to have even rags from non-infected ports admitted at the warehouses of the city, or disinfected in their neighborhood.

On the other hand, an influential class of merchants in New York and the adjacent cities urged that the record of sickness among "rag sorters," and those who handled them at the paper mills, was not greater than among workmen engaged in many other occupations.

At the meeting of the committee of the conference with the Secretary of State it transpired that at a cabinet meeting the previous

day, the discussion of the disinfection and admission of rags had developed a difference of opinion in respect to their admission before or after disinfection.

The interview with the Secretary of the Treasury terminated with his request that a communication should be made to him by the committee, in which their views on the subject should be fully expressed.

In compliance with the request of the Secretary the following was submitted as the judgment of the committee :

WASHINGTON, D. C., *December 11, 1884.*

To the Honorable HUGH McCULLOCH, *Secretary of the Treasury :*

SIR — The committee appointed by the Conference of State Boards of Health, to consider the subject of national action relating to health, which committee had the honor of an interview with you this day, hereby respectfully submits the view of the committee respecting the particular source of danger to health upon which you have expressed a wish to receive the opinion of the committee, namely, from imported rags. Members of this committee believe that contagious diseases dangerous to the public health occur in the homes of the people in every country, that old rags are collected mainly from among cast-off material from the homes of the people, and that old rags, in whatever country collected, are not free from danger, and that it would tend to prevent the introduction into this country of more than one contagious disease if all old rags imported into the country should be disinfected before, or on entrance at the port of entry.

This committee are of the opinion that disinfection of old rags can be effected by boiling them thoroughly, by exposing them to superheated steam so as to assure a temperature equal to or exceeding 212 degrees, by the use of sulphurous acid gas — the rags being fully exposed to the action of such gas in the ratio resulting from the burning of 22 pounds of sulphur to each 1,000 cubic feet of air, or by the use of the latter agent in any other form or manner which shall secure the subjection of the rags to that agent in an effectual manner.

This committee further express the opinion that the disinfection of rags should be allowed to be effected in any country when a proper inspection of the process of disinfection can be secured, and such disinfection certified to by a representative of the United States.

Very respectfully yours,

H. P. WALCOTT, *Chairman.*

S. S. HERRICK, *Secretary.*

Lastly, in this series of circulars from the Treasury Department, regulating the management of the local quarantines, through orders given to the collectors of customs, appeared the following :

TREASURY DEPARTMENT, OFFICE OF THE SECRETARY, }
WASHINGTON, D. C., *December 22, 1884.* }

To Collectors of Customs and others :

All circulars of the department concerning the importation of old rags are modified as follows :

No old rags except those afloat on or before January 1, 1885, on vessels bound directly to the United States, shall be landed in the United States from any vessel, nor come into the United States by land, from any foreign country, except upon disinfection, at the expense of the importers, as provided in this circular, or as may hereafter be provided.

Either of the following processes will be considered a satisfactory method of disinfection of old rags, and will entitle them to entry and to be landed in the United States upon the usual permit of the local health officer, viz :

1. Boiling in water for two hours under a pressure of fifty pounds per square inch.

2. Boiling in water for four hours without pressure.

3. Subjection to the action of confined sulphurous-acid gas for six hours, burning one and a half or two pounds roll brimstone in each 1,000 cubic feet of space, with the rags well scattered upon racks.

4. Disinfection in the bale by means of perforated screws or tubes through which sulphur dioxide, or superheated steam at a temperature of not less than 330 degrees, shall be forced under a pressure of four atmospheres for a period sufficient to insure thorough disinfection.

Old rags may be landed and stored at such places as may be approved by this department for the purpose of undergoing any of the processes of disinfection before named, and upon the completion of such process to the satisfaction of an inspector of customs and the local health officer, the rags may be delivered to the importer or consignee.

Old rags may be subjected to disinfection by either of said processes in any other country where this department may appoint an inspector to superintend the same, whose certificate of such disinfection shall be authenticated by a United States consular officer according to Department Circular No. 61, of April 22, 1884.

H. McCULLOCH,
Secretary.

The public apprehension in relation to the contagion which is imported with old rags has been referred to; this, in connection with the extent of this commercial industry at the port of New York, affords an explanation of the consideration given to their importation and disinfection.

For the eleven months preceding the 30th of December, 1884, rags were imported from thirty-nine foreign ports. The annual importation exceeds 150,000 tons, of an estimated value of \$15,000,000. An article of commerce enlisting capital and industry to this extent should be neither excluded nor oppressed by quarantine regulations except when it is demanded by well-founded apprehension of danger from it, as an importer of contagion or infection.

The provision made in the circular of the Treasury Department, which allowed rags to be subjected to disinfection by either of the processes mentioned "in any other country where the department may appoint an inspector to superintend the same," was wisely conceived but can be of little practical benefit to the shippers, from the fact that but few ports in the world ship enough rags to this country to make it an object to incur the expense of disinfection and supervision before shipment. The same objections will limit the disinfection of rags to a few of the larger ports of the United States.

The difficulty which has hitherto met quarantine officials at our sea-ports has been to secure efficient disinfection of rags in the bale. To open the bales and boil, dry and re-bale them, or to distribute and disinfect with sulphurous acid gas would involve an expense in the preparation of buildings, machinery and labor, that would greatly increase their cost at the manufactories, without in the least increasing their value. This difficulty has been overcome by an ingenious invention by which superheated steam is introduced into the bale in the following manner: A wooden box lined with zinc, large enough to admit a bale of rags, is used as a receptacle for the bale; the front of the box is closed when the bale has been introduced, by a door which is hung by its upper end; the bale is inserted in the box by placing it on a hand truck in contact with the ends of five pointed hollow screws perforated throughout their length, each about one and one-half inches in diameter and four feet in length, and projecting from the end of the box opposite the door, and connected with pipes through which the superheated steam is admitted; the pipes are arranged so as to divide the long diameter of the bale into nearly equal parts; when the bale touches the end of the screws, the machinery is set in motion, the screws revolve from left

to right, penetrate the bale nearly its whole length, and the bale is drawn within the box by the movement of the screws; when the bale is fully within the box the lid, or door, falls to its place and steam, heated to 300 degrees and upward, is forced into the bale through the screws; after five minutes the bale is withdrawn from the box by a reverse motion of the screws; a thermometer introduced into any part of the bale immediately after it is removed from the steam chest will indicate a temperature of 250 to 280 degrees.

The order of the Treasury Department, dated December 22, 1884, forbidding the landing of "old rags from any foreign country" that were not afloat January 1, 1885, compelled importers of that article to choose one of the methods indicated in the foregoing circular. And the accumulation of old rags at ports recently infected by cholera, that were waiting shipment to this country, was so considerable, that owners and consignees became exceedingly anxious for some arrangement by which their disinfection could be effected.

With the desire to secure a practical demonstration of the value of the two agents, superheated steam and $S. O^2$, one of which was proposed to be used by the Paper Stock Disinfecting Co., in the disinfection of old rags in the bale, Dr. George M. Sternberg, surgeon U. S. A., was employed for the purpose of making biological tests designed to ascertain whether these agents could be used by the apparatus hitherto described to effectually disinfect rags in the bale.

Preliminarily it should be stated, that during the summer and fall of 1884, a supply of sulphurous acid gas under a pressure of six atmospheres was obtained from time to time of W. J. Pollock, a manufacturing chemist of New York, for use in disinfecting the steerage of passenger steamers, and the baggage of immigrants.

This agent, as produced by the combustion of sulphur in the air of a room, has long occupied a first rank among health authorities as a disinfectant of the contagion arising from many forms of disease. There is no disinfecting agent known that has been more extensively used from immemorial time.

The rooms occupied by small-pox patients, and the clothing worn by them, are disinfected by the combustion of at least two pounds of sulphur in 1,000 cubic feet of space, with great certainty as proved in thousands of cases. The same is true of rooms and clothing infected by cases of scarlatina and diphtheria. The evidence of this is more conclusive in the contagion of small-pox than most other

contagions, because the contagion is more certain in its effect on the person exposed.

The confidence which experience and observation have given sanitary authorities in the gas produced by burning sulphur, as a destroyer of contagion has contributed to the desire to lessen the difficulties and dangers attending its production, and increase the facilities for its use. The extent of the combustion of sulphur, and consequently the production of $S. O^2$., depends on the supply of oxygen in the atmosphere. In the ill-ventilated steerages and hospitals of immigrant steamers, it is often difficult to burn sufficient sulphur to destroy insect life. In the presence of a contagion like cholera, whose resistance to the action of germicides is undetermined, and the failure to destroy which might be followed by the most unfortunate results, it is desirable to increase its efficiency, and thus the confidence of sanitarians in this agent by ability to supply it to any extent and under all circumstances when necessary.

The use of $S. O^2$., under compression in copper tanks of any desired size, with stop-cock by which the supply can be regulated *ad libitum*, such as might be carried by the person engaged in disinfecting rooms or the steerages of steamers, or in much larger reservoirs for the disinfection of large quantities of baggage, clothing or goods of any kind, seemed to supply the means for securing the desired result.

Under these circumstances, and with a desire to make the application of the tests as practical as possible Dr. Sternberg came to New York and at the Baltic stores in Brooklyn, in the presence of several gentlemen of note, among whom may be mentioned Assistant Secretary, H. F. French, of the Treasury Department; William H. Robertson, Collector of the port of New York, the Health Officer of the port of Boston, the Secretary of the State Board of Health of Massachusetts, Dr. Lindsay of the New Haven Board of Health, and Dr. J. H. Raymond, Health Commissioner of Brooklyn, a series of experiments were undertaken, which will be best illustrated in the language of Dr. Sternberg as published in the "Medical News," page 346, vol. XLVI.

"I visited New York for the purpose of applying biological tests in an experiment designed to ascertain whether it is practicable to disinfect rags in the bale. A manufacturing chemist of New York proposed to accomplish this by injecting sulphur dioxide into the interior of the bales through hollow tubes. The $S. O^2$., had been compressed to the liquid form in copper cylinders, and being under the pressure of six atmospheres was expected to permeate the bale thoroughly

when the valve was opened leading to the hollow and perforated screws introduced into it. The bale was to be placed in a closed chest of moderate dimensions, and disinfection was to be accomplished.

The experiment was made at the Baltic stores, Brooklyn, in the presence of Dr. Smith, Health Officer of New York, Dr Raymond, Commissioner of Health of the city of Brooklyn, and several other gentlemen belonging to the health department of New York and of Massachusetts.

The following material which I had brought in sterilized tubes from the biological laboratory of Johns-Hopkins University, Baltimore, was introduced into the bale through openings made with a pocket-knife. The depth of these openings was from two to four inches. The material to be disinfected was upon pledgets of cotton previously sterilized, which had been saturated with pure cultures of the various test organisms. Some of these pledgets had been subsequently dried at a low temperature, others remained moist. The apertures in the bale were closed, after introducing these bits of cotton, by tamping in strips of old muslin. When these preparations had been made the bale of rags was placed in the disinfection chamber and the gas turned on. The time during which the gas was allowed to flow was three minutes and a half. The pressure, as shown by a gauge in connection with the copper cylinder, was eighty pounds at the commencement and seventy-five at the close of the experiment. The disinfection chamber was not tight, and all those in the vicinity were obliged to retire to a respectful distance to windward while the gas was flowing and for a considerable time afterward, owing to the abundant escape and stifling effect of the S. O². It was only after an interval of twenty or thirty minutes that the disinfection chamber could be approached to withdraw the bale, and after it had remained in the open air for some time, I was almost suffocated while removing the pledgets of cotton containing the test organisms. These were at once placed, with sterilized forceps, in sterilized glass tubes, and each glass tube was at once plugged with sterilized cotton. In this way they were taken back to the laboratory in Baltimore, where the test of disinfection was completed by culture and inoculation experiments. The nature of the material and the result of the experiments are given in the accompanying table.

Other pledgets of cotton had been exposed in the bale, which had been saturated with tuberculous sputum, but this part of the experiment was not followed up, owing to the scarcity of rabbits for inoculation."

No. of tube containing cotton pledget.	NATURE OF MATERIAL.	Test by cultivation.	Result.	Test by inoculation.	Result.
No. 1.	<i>Bacillus anthracis</i> containing spores (dry).	One culture tube.	Abundant development of anthrax filaments in twenty-four hours.	One rabbit inoculated subcutaneously.	Died of anthrax on third day.
No. 2.	<i>Bacillus anthracis</i> containing spores (dry).	One culture tube.	Abundant development of anthrax filaments in twenty-four hours.	One rabbit inoculated subcutaneously.	Died of anthrax on third day.
No. 3.	<i>Bacillus anthracis</i> containing spores (moist).	Two culture tubes.	Abundant development in both.	One rabbit inoculated.	Survived the inoculation.
No. 4.	<i>Bacillus subtilis</i> spores (dry).	Two culture tubes.	Abundant development of <i>bacillus subtilis</i> in both.		
No. 5.	<i>Bacillus subtilis</i> spores (moist).	Three culture tubes.	Abundant development of <i>bacillus subtilis</i> in each.		

At the time of the experiments referred to the apparatus at the Baltic stores was by no means as perfect as it should have been. The chest or box in which the bale was inclosed was not close, and in consequence much of the gas escaped as soon as it was delivered into the bale, while the material to be disinfected was not exposed to exceed thirty minutes. For the efficient disinfection of rooms or clothing supposed to be infected with the contagion of small-pox, diphtheria, scarlatina and yellow fever, it is considered necessary to expose them to the gas for several hours in a tight room or vessel.

Subsequent experiments by Dr. Sternberg demonstrated that *micrococci* obtained from the following pure cultures, to-wit: vaccine vesicle, vaccinal erysipelas, from blood from a fatal case of pureperal septicæmia, and *micrococcus urea* (culture in beef tea) when exposed under a bell jar having a capacity of one gallon, to liquid S. O.² sufficient to make when volatilized twenty volumes per cent, resulted in complete disinfection after an exposure of eighteen hours, "as was proved by attempts to start cultures from the exposed organisms." Both moist and dry pledgets of sterilized cotton previously saturated with the culture were used in the experiments.

It will be observed that the report of the tests at the Baltic stores relates only to the *bacillus anthracis* and *bacillus subtilis*. Other organisms were subjected to the same tests, but no report of the result has been made.

The fact that S. O.² fails to destroy the spores of the *anthrax bacillus* does not afford sufficient reason for rejecting an agent that has given sanitarians greater satisfaction from its efficiency in the destruction of contagion than any hitherto known to them.

If the contagion of small-pox, scarlatina and diphtheria, and the infection of yellow fever, is destroyed by sulphurous acid gas, as the experience of thousands who have used it for that purpose attests, health authorities should not discard it until a more efficient and convenient agent is discovered.

The *anthrax bacillus* is known to be the most resisting to the action of germicides of any of the organisms discovered. Vallen, Gattier, Pasteur, Koch, Sternberg and others, have contributed to establish by their investigations the *probability* that micro-organisms are the cause of the contagious and infectious diseases. And if it be true that the contagious character of the diseases mentioned depends upon germ-life, we may conclude that it does not have the resisting power which the spores of the *anthrax bacillus* possess. Since it is impossible to say from demonstrated facts that these diseases are

attended by micro-organisms with spores, or micro-organisms without them, is it wise, in the face of the experience of its efficiency under the observation of innumerable witnesses, to exclude from our list of germicides an agent because it fails to destroy the most resisting of the forms of germ life ?

During the past five years more than a hundred hospitals or rooms, on passenger steamers, occupied by small-pox patients on arrival at the New York quarantine have been disinfected with S. O.² as produced by the combustion of sulphur in the room to be disinfected. In most cases the bed clothing (except mattresses and pillows, which were invariably burned) and such personal clothing of the patient and attendant as were not sent to the hospital with the former, were hung up on lines or hooks in the room occupied by the patient, and were submitted to this agent for at least ten or twelve hours. There has not been an instance in this experience, in which the reproduction of the disease could be traced to insufficient disinfection.

In the article of Dr. Sternberg previously referred to, he says : "My experiments show most conclusively that S. O.² does destroy the specific infecting power of vaccine virus dried upon ivory points, when present in the air of a disinfecting chamber in the proportion of one volume per cent."

It is reasonable to suppose that there should be a correspondence in the effect of sulphurous acid gas upon the contagion of small-pox, if, as is probable, its development is dependent on organisms. As before stated, experience confirms this theory.

"Admitting," says Dr. Sternberg, "that, in the absence of spores, micro-organism suspended in the atmosphere, or attached to the surface of objects, may be destroyed by sulphur dioxide, when generated in sufficient quantity in a well-closed apartment, and in the presence of moisture, the question remains whether the same object may not be as well accomplished by thorough ventilation, and by washing all surfaces, walls, ceilings, floors, furniture, etc., with a 1: 1000 solution of mercuric chloride."

Theoretically, this suggestion is correct ; but practically, it is wrong, because there are often conditions which will prevent its adoption. The hospital on a passenger steamer, "for instance, when located between decks, cannot be thoroughly ventilated" while the passengers are on board, except by opening the doors of the hospital, which would be likely to expose the many persons to the contagion in the room.

Those familiar with the construction of sea-going steamers are aware that the ventilation afforded by the "port light" is often very inadequate, even for the well passengers. And when cases of contagious disease are found in the steerage, as is not unfrequently the case, it would be impossible to wash all its "surfaces, walls, floors and ceilings" before the removal of the passengers. Whatever needs to be done in disinfecting a vessel must be done while it is "in quarantine"—as a rule it will not be thoroughly done elsewhere.

The disinfection of rags in bale by the use of superheated steam was also tested at the Baltic stores on the occasion of Dr. Sternberg's visit.

Organisms of the same class, and introduced into the bale in the same manner, were employed to test the germ-destroying power of moist heat, and proved to be eminently practical and successful.

Inoculations from the *anthrax bacillus* exposed on this occasion failed in every instance. Subsequent experiments by Dr. Sternberg have afforded conclusive evidence that the most resisting spores are destroyed by a temperature of 230° F. "A temperature of 221° maintained for two minutes destroys the spores of anthrax, and all micrococci and bacilli not containing spores are quickly destroyed by a temperature much below the boiling point of water." *Sternberg's Report*.

The conclusions to be drawn and the benefits to be derived from the investigation thus far in relation to S. O.² may be briefly summarized as follows:

This agent fails to destroy the spores of the *bacillus anthrax*, or of *B. subtilis* with any degree of certainty.

It destroys micrococci and bacilli without spores, in the presence of moisture, after prolonged exposure.

The known organisms without spores are destroyed by exposure of several hours to a proportion of gas of five per cent and upward per 100 volumes of air.

The rapid escape of this agent when employed as a disinfectant in well-closed apartments or vessels requires a considerable supply beyond the amount actually necessary for disinfection. To effectually disinfect personal clothing, bed clothes, and baggage of every description, the articles should be suspended singly in the disinfecting room. Mattresses, pillows and such articles as cannot be put into water of a temperature not less than 212°, or a solution of bi-chlorate of mercury of one in 1,000, should be destroyed by fire.

Rooms or clothing in which there is moisture will be more efficiently disinfected, other conditions being equal.

In respect to the use of moist heat it may be said, that when a temperature of 212° F. can be secured, either by immersion in water, or by steam, it is one of the most effectual of the disinfectants which the sanitarians can employ.

WM. M. SMITH,

Health Officer Port of New York.





